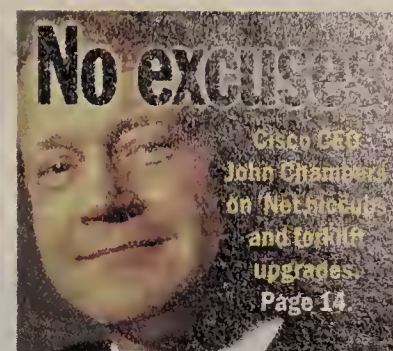


# NetworkWorld

THE NEWSWEEKLY OF ENTERPRISE NETWORK COMPUTING



ComNet showdown. 3Com's Mick Seaman, Bay's Brian Brown, Cabletron's Chris Oliver and Cisco's Alan Marcus (L to R) defend their companies' switching strategies.

## THE BIG FOUR GO TOE-TO-TOE

Vendors address standards, performance and migration issues.

By Jodi Cohen  
Washington, D.C.

**W**hen top technical executives from the Big Four internetworking players get together in the same room, the conversation is bound to get interesting. But when those same execs are placed before a user/analyst panel asking tough technical questions about their companies' switching strategies, things can get downright testy.

And that's exactly what happened at *Network World's* Switching Showdown, a session held at last week's ComNet '97 show here.

The top technical visionaries brought together for the debate were Cisco Systems, Inc.'s Alan Marcus, director of technology marketing; Cabletron Systems, Inc.'s Chris Oliver, director of engineering and technology vision; Bay Networks, Inc.'s Brian Brown, director of product management; and 3Com Corp.'s Mick Seaman, vice president and chief technology officer.

The questioning panel, led by *NW* Editor in Chief John Gallant, included Thomas Nolle, president of the CIMI Corp. consultancy in Voorhees, N.J.; Kevin Tolly, president and chief executive officer of The Tolly Group, a testing and consulting firm in Manasquan, N.J.; and Robert Riehl, technical advisor to the advanced communications technology department at the Defense Information Systems Agency.

See Debate, page 8

THE  
**GREAT**  
NetworkWorld  
\*\*\*\*\*  
**SWITCHING**  
DEBATE

## Fast modems, slow ISPs

ISPs want a standard before offering access services based on 56K bit/sec modems.

By Tim Greene  
and Denise Pappalardo

When 56K bit/sec modems hit the streets later this month, they will be all revved up with nowhere to go.

Performance problems and a market split into two incompatible camps are scaring off Internet service providers, and some of the biggest will not offer the fast access until late this year, or even next.

## Novell to ease user migration away from IPX

By Christine Burns  
Orem, Utah

Novell, Inc. next month will outline plans to phase IPX out of IntranetWare in favor of TCP/IP while also trying to minimize management headaches for its IPX installed base.

The company will formally detail at its BrainShare conference plans to relieve the core NetWare directory, security, and file and print services of their IPX dependency. This fits with the company's plan later this year to roll out a native TCP/IP edition of IntranetWare — the

See Novell, page 49

Major Internet access players, including UUNET Technologies and BBN Planet, are content to wait until a 56K bit/sec modem standard is set. An interim U.S.-only standard is not expected until year-end at the earliest, and a final international standard is not expected for a couple of years.

Modem chip makers Lucent Technologies, Inc. and Rockwell International Corp. have agreed to make their products compatible, but U.S. Robotics is cranking out a line of modems that will not interoperate, at least at higher speeds, with the Lucent/Rockwell-based rivals.

CompuServe, Inc., which did

See Modems, page 48

More  
**COMNET**  
coverage...

► AT&T reveals ATM pricing and switched virtual circuits.

Page 6.

► Ipsilon executive Larry Lang says the IP switch pioneer is ready to address IPX.

Page 8.

► U.S. Robotics discloses ATM plans. Page 8.



## Cabletron and FORE prep switch news for Interop

By Jodi Cohen  
Washington, D.C.

Cabletron Systems, Inc. and FORE Systems, Inc. are readying significant LAN switching enhancements to be announced this spring.

Cabletron will introduce at NetWorld+Interop '97 in May beefed-up protocol support and more sophisticated policy-based management features with the

next release of its SecureFast switch software, company officials said last week.

At the same show, rival FORE will announce it is doubling the backplane speed of its high-end LAN switching hub, while adding Fast Ethernet modules and more chassis slots.

Cabletron's SecureFast — the company's spin on IP switching — adds the routing, call accounting and management capabilities customers require to get the most out of their Multi Media Access Center (MMAC)-based

See Switching, page 14

## More snap for distributed apps

By John Cox

The leading object technology and messaging middleware vendors are gearing up to hash out a standard way to link their products so users can deploy larger and more reliable distributed applications.

While object-based applications and legacy programs encapsulated in object wrappers can communicate over networks today, bolting on messaging middleware would add capabilities that these applications lack. A product such as IBM's MQ-

Series, for example, could benefit object-based applications by prioritizing messages, ensuring they are delivered in sequence despite network failures and balancing traffic loads over multiple servers.

The list of vendors putting together the proposed standard reads like a who's who of distributed application technology. Supporters include messaging middleware suppliers IBM and PeerLogic, Inc., as well as object request broker (ORB) vendors

See Applications, page 48

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## IP SWITCH PARTY

RND's PowerIP Layer 3 switch (shown here) and Toshiba's CSR 5300 IP switch are the latest entrants in this burgeoning market. Page 15.



## IBM WOOS WINDOWS USERS

Windows 95 and NT users gain improved access to Warp Server machines. Page 10.



## SHOW ME THE MONEY

Venture capitalist Ann Winblad is one of the first people cash-hungry start-ups visit. Page 27.



EDWARD CALDWELL

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*This Week*

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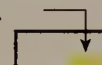
- **Switching.** Not only can you read our reports on the Switching Showdown at last week's ComNet '97 show, you can listen to and watch excerpts from the event. Download a free Xing StreamWorks client and tune in while you grab white papers on switching strategies from Bay, Cabletron, Cisco and 3Com. **DocFinder: 0320**
- **Switching.** See what Cisco CEO John Chambers has to say about Internet instability linked to Cisco routers and about product upgrades in our exclusive interview. And read his comments on consolidation in the high-tech industry. **DocFinder: 0631**
- **Telecom reform.** Telephone carriers could soon face new competition — from electric companies. Read how Carolina Power & Light and other utilities are beginning to turn their internal telecom systems into public telecom nets. **DocFinder: 0632**
- **Intranets.** FedEx is looking at swapping out 20,000 3270 dumb terminals with network computers, both to give end users more computing power and to reduce potential problems in the year 2000. Read up on its intranet plans. **DocFinder: 0633**

### News+

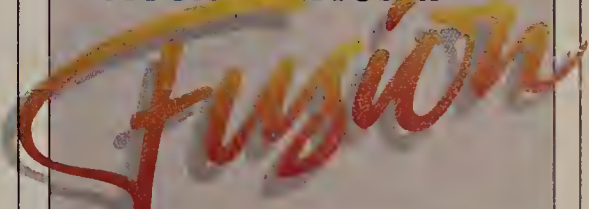
- **56K modems.** Read our page 1 article on these modems, then come online for technical overviews of competing 56K bit/sec specs from U.S. Robotics and Lucent/Rockwell. **DocFinder: 0634**
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BRIAN RASZKA

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**Review:** Four low-cost, software-based desktop videoconferencing packages that will give you the basics — at least. Page 37.



ELIZABETH BRANDT



## News briefs, February 10, 1997

**Distributed security**

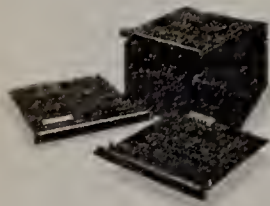
IBM's Tivoli Systems subsidiary next week is expected to roll out new security modules for its TME 10 management package. Sources said the modules will let users enable secure sign-on to multiple applications distributed across an enterprise, and improve name service, user administration and access control features of TME 10. The modules will also help users centrally keep track of and correlate security events across the enterprise.

**GroupWise goes forward**

Novell, Inc. last week announced GroupWise 5.1, an upgrade intended to fix migration difficulties in the earlier version, as well as to add support for Lightweight Directory Access Protocol on the client. It will be available for free later this month to GroupWise 5 customers. In addition, Novell announced an open beta availability in March for the next version of GroupWise WebAccess, which will include Java and HTML 3.0 support.

**Cisco to strengthen switches**

Cisco Systems, Inc. last week reiterated plans to add Layer 3 switching to its Catalyst 5000 switch. This capability, promised since the Catalyst 5000 debuted in 1995, will allow the switch to forward packets to destination subnets based on network layer addresses. "Customers are telling us that other things are more important" than the Layer 3 capability, said Alan Marcus, director of technical marketing at Cisco, in explaining the delay. Cisco is also working out issues regarding the development of routing Application Specific Integrated Circuits for the switch, he said. Marcus also said new line cards are on the way for the Catalyst 5000 that include Layer 3 forwarding, higher density ports and "more" ATM connectivity.

**Oracle bonds with Borland**

In an effort to make it easier for customers to build Network Computer applications, Oracle Corp. last week said it will license C++ and Java compilers, as well as development tools from Borland International, Inc., and integrate them with Oracle's Designer 2000 and Developer 2000 tool sets. Borland's C++ Builder and JBuilder (for Java applications) both use the graphical environment of Borland's popular Delphi development product.

**Open Market finds a bargain**

Electronic commerce product vendor Open Market, Inc. last week said it plans to buy Boston-based Waypoint Software Corp. for about \$12 million. Waypoint specializes in Internet business-to-business catalogs for the manufacturing industry.

**Microsoft passes on PowerPC**

Microsoft Corp. plans to phase out development of Windows NT for PowerPC, citing shrinking demand for those systems. Microsoft's plans, revealed last week, follow December announcements from IBM, Motorola Corp. and Groupe Bull that they planned to stop building PowerPC-based machines designed to run Windows NT.

**AT&T forms managed nets unit**

AT&T last week collected its existing managed-network offers — such as its managed router and managed frame relay access device services — under a new business unit called Managed Network Solutions (MNS). Under MNS, each ongoing part of a customer's managed network, such as a transport service or class of CPE, will generate a monthly charge. Certain professional services, such as design and implementation, will result in a onetime charge. MNS may employ as yet unspecified partners to manage LAN CPE, such as servers and workstations, AT&T officials said. Specific offer-element pricing will become available during the next few weeks, they said.

# ATM, frame prices prove to be similar

By David Rohde  
and Denise Pappalardo  
Washington, D.C.

Long-distance carriers are pricing variable bit rate (VBR) ATM services at parity with frame relay, several big players admitted at ComNet '97 last week.

Analysts said parity pricing means early ATM users are still paying a hefty chunk of change since bit for bit ATM chews up more overhead than the super-lean frame relay format.

At higher speeds — for which there are few frame relay equivalents — the emerging prices show ATM is potentially more economical than leased lines. A T-3 ATM port is roughly five times the cost of a dedicated T-1 port, but offers 28 times the capacity.

At the show here, AT&T became the first big interexchange carrier to release ATM port and virtual circuit charges. AT&T's price list shows a T-1 port — the lowest speed available for ATM and the highest for its frame relay service — costs \$2,200 a month for either service.

VBR permanent virtual circuits (PVC) up to 1.024M bit/sec also run the same for both services, though AT&T users must pay considerably more if they choose ATM's constant bit rate (CBR) quality of service, typically recommended for voice and video (see graphic).

In a new option, AT&T also introduced switched virtual circuits (SVC), which can be dialed up at will, and released per-minute pricing based on usage only. Customers can shave 2% to 30% off all these list prices via one- to five-year term contracts, said Joe Lueckenhoff, an AT&T product management vice president.

The same practices are being followed by MCI Communications Corp. and Sprint Corp., which also unofficially offer SVCs up to T-1 speed, according to Steve Sazegari, president of TeleMac, a San Francisco telecommunications consultancy.

Carriers are trying to simplify users' service selection by making frame and ATM prices equivalent and focusing on applications, with most data-only WAN needs steered to frame relay and multimedia applications pointed toward ATM, Sazegari said.

Brad Hokamp, director of advanced data services for Sprint, confirmed the carrier has been pricing equivalent ATM and frame relay ports and circuits at the same rate.

Despite the pricing parity,

ATM users can expect their bills to trend higher than frame relay, experts warned.

Many frame relay users choose low, or even zero, PVC committed information rates (CIR) because the risk of dropped frames is minimal on typically underutilized frame relay circuits. But ATM's much higher speeds virtually require users to choose a realistic CIR to ensure a clear path.

A raft of ComNet observers

agreed that public pricing will help buoy ATM, but not much.

"Carriers are deploying ATM, and ISPs are rapidly galloping off in the ATM sun-

set," said Jennifer Pigg, director of data communications for The Yankee Group, a Boston-based consultancy. But the industry is still lacking multimedia applications that will drive ATM demand on the user side, she said. ■

**CRUNCHING THE NUMBERS**

Virtual circuit prices were released last week for AT&T's commercial ATM service.

Connection speed (Bit/sec)	VBR PVCs (Per month)	CBR PVCs (Per month)	VBR SVCs (Per minute)	CBR SVCs (Per minute)
16K	\$29	NA	1 cent	2 cents
64K	\$94	\$165	3 cents	5 cents
256K	\$429	\$743	14 cents	25 cents
1,024K	\$2,071	\$3,605	69 cents	\$1.20
6,144K	\$5,400	\$9,180	\$4.50	\$7.65

Each PVC or SVC node requires a port connection at the monthly rate of \$2,200 for a DS-1 (1.5M bit/sec) port or \$11,000 for a DS-3 (45M bit/sec) port. Term and volume discounts are not included.

CBR = Constant bit rate    NA = Not available    PVC = Permanent virtual circuit  
SVC = Switched virtual circuit    VBR = Variable bit rate

## Domain names system revised

By Rob Guth

A coalition of Internet insiders last week announced a plan to revamp the Internet's Domain Naming System (DNS).

The plan, which needs to be approved by Internet service committees, is the latest maneuver in a year-long battle among groups trying to determine how 'Net domain names — identifiers such as mcdonalds.com or red-cross.org — are assigned.

Under the plan announced by the International Ad Hoc Committee (IAHC), the Internet would see seven new generic top-level domain names, which would be distributed by up to 28 domain name registrars around the world (see graphic).

Backers say the new scheme is meant to address core problems with the current DNS, including its U.S.-centric administrative structure and its lack of a system for arbitrating trademark disputes over domain names.

The IAHC believes it has the stature to make the new domains stick. It draws its 11 members from high-profile international

organizations such as the Internet Society and the Internet Assigned Numbers Authority. The IAHC also expects to win over the company that currently has a near monopoly on domain names, Network Solutions, Inc.

Since its inception, the IAHC has been surrounded by debate. Critics argue that it does not represent all the interested parties affected by changes to the DNS.

Guth is an IDG News Service correspondent.

**NAME CALLING**

New top-level Internet domain names and intended users

.arts	Entities emphasizing cultural and entertainment activities
.firm	Businesses or firms
.info	Entities providing information services
.nom	People who want individual or personal designation
.rec	Entities emphasizing recreational or entertainment activities
.store	Businesses offering goods for purchase
.web	Entities emphasizing activities related to the World-Wide Web



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## Debate

Continued from page 1

None of the participants would single out a winner, however, a straw poll of the audience said Cabletron came out on top.

Riehl chose Cisco as his first victim, asking how Cisco plans to offer an integrated ATM solution given that the company has myriad ATM gear — ranging from the products it acquired from LightStream Corp. and StrataCom, Inc., to Cisco's homegrown ATM switches.

Marcus explained that customers such as Internet service providers and telephone companies have different requirements than customers running campus networks. "It's not so much having to integrate all that technology, but it's adapting those technologies to apply to the different market spaces that ATM plays into," he said.

But Cisco came up short on details about how a large enterprise network customer would go about using all of Cisco's ATM products and do integrated network management across them.

When it came to multilayer switching, the panel pointed out that Bay has not participated in the recent IP switching wars. Nolle asked the company about whether Layer 3 routing can be expedited to make performance acceptable without resorting to some form of virtual circuits.

"In a purely frame-based network, Bay views a more evolutionary approach to the classic multiprotocol routing model, where Layer 2 switches are dropped in front of routers to break up collision domains and enhance intrasubnet performance," Brown said. "[Bay's model] going forward does the very same thing at Layer 3."

Unlike its competitors, Bay only supports the circuit-based Layer 3 concept when ATM is the backbone, Brown said.

But the panel's vendor-specific questions were merely a warm-up for the next phase of the showdown, during which the vendor representatives asked each other questions.

3Com's Seaman picked on Cisco, asking when Tag Switching will actually be nailed down as a standard. "Tag Switching is a draft in the IETF now, and we're hoping to see a standard finished around summertime or by the end of the year," Marcussaid.

Not to be outdone, Cabletron blasted Cisco by criticizing its support for multiple technologies rather than providing a

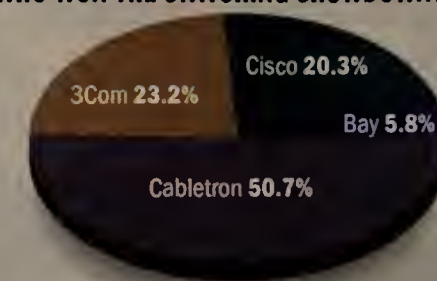
# THE GREAT NetworkWorld SWITCHING DEBATE

needs of large routed backbones, while [Multi-Protocol over ATM] is an inter-VLAN cut-through protocol for ATM," he said.

But Oliver didn't buy it. "If cut-through routing works for ATM, why can't we use it instead of routers in LANs and large backbone networks? Why do we need Tag Switching for backbone networks, which seems to preserve the role of those lovely big routers?" Oliver asked.

"On the campus, I agree that we don't need actual routers, and Cisco is looking at

## WHO WON THE SWITCHING SHOWDOWN?



Based on exit poll of 69 audience members.

faster ways to transport Layer 3 traffic across the campus," Marcus said. "But when you are looking at very large routed networks like an ISP, Tag Switching helps solve a lot of the issues [like routing updates] where MPOA is not going to do the trick." ■



**"Cabletron is focusing on overcoming the fear and doubt [Cisco has spread] that our products do not perform."**

**CHRIS OLIVER**, Cabletron. In response to Cisco's challenge of Cabletron's high-throughput numbers.



**"I get the feeling that people wonder why it's taking [us] so long to add Layer 3 switching [to the Catalyst 5000]."**

**ALAN MARCUS**, Cisco



**"Is Cabletron going to continue the closed nature of its SecureFast switching solution?"**

**MICK SEAMAN**, 3Com

**"The arbitrary mixture of apples and dough do not necessarily make a pie."**

**THOMAS NOLLE**, CIMI. In reference to Cisco's inability to tie Tag Switching and NetFlow into its overall switching architecture.



**"We're looking for integrated solutions, and right now, it's incumbent upon the user to do all of the integration."**

**ROBERT RIEHL**, DISA



## U.S. Robotics trots out ATM

By Tim Greene  
Washington, D.C.

Departing from its remote access roots, U.S. Robotics last week revealed plans for two ATM switches to connect LANs locally and across the wide area.

The two new ATM chassis, TotalCell 200 and TotalCell 800, will support 155M bit/sec ATM as well as DS-3 wide-area trunks to a backbone switch or a wide-area ATM service.

They are scheduled to be announced formally next month and to ship in May. "We are getting closer to the backbone," said Al Kotob, product marketing manager for U.S. Robotics. Pricing for the TotalCell switches has not been set.

U.S. Robotics products already include the TotalSwitch LAN switching hubs. The firm said 155M bit/sec ATM cards for those switching hubs will be ready to ship about midyear.

The new TotalCell switches would connect with native ATM LANs or Ethernet or token-ring LANs via ATM uplinks from LAN

switches or routers.

TotalCell switches are based on technology bought from Scorpio Networks last year. In fact, the only ATM device U.S. Robotics had on display at ComNet '97 was a Scorpio switch that was painted black and had a U.S. Robotics logo stuck to it. When finished, the actual TotalCell switches will feature LAN emulation, beefed-up buffering and power, as well as Web-based management tools. The company will enhance the switches around midyear by adding an OC-3 single-mode fiber interface at 155M bit/sec. Next year, it will offer an OC-12 interface at 622M bit/sec.

The firm has taken a stand on 25M bit/sec ATM: Just say no. It will not support 25M bit/sec ATM because the price between it and 155M bit/sec ATM is shrinking, making 155M bit/sec ATM the smarter buy, Kotob said.

©U.S. Robotics: (800) 342-5877.



## Ipsilon won't neglect IPX customers

Company ready to make move beyond IP switching roots.

By Jim Duffy  
Washington, D.C.

Ipsilon Networks, Inc. is ready to take network layer switching beyond IP.

The company last week demonstrated support for Novell, Inc.'s venerable IPX protocol at the ComNet '97 show here. Though Ipsilon did not actually demonstrate IPX switching, the company did show operation of IPX routing protocols — Routing Information Protocol and Service Advertisement Protocol — as a place setter for the impending IPX switching rollout.

Ipsilon hopes to ship software in March that provides native IPX virtual circuit-based cut-through forwarding, according to Larry Blair, Ipsilon's vice pres-

ident of marketing.

Larry Lang, the company's vice president of product management, added: "IP is still our strategic protocol. But I've got a lot of IPX traffic, so what am I going to do?"

Ipsilon's IP Switch ATM 1600 can forward roughly five million IPX packets per second over ATM virtual circuits, the same throughput the company achieves switching IP, Lang said.

Ipsilon does not compress IPX headers to achieve this throughput, he added.

The company has not yet delivered IPX switching to customers, nor has it determined whether to package the software as a new release of its IP Switch ATM 1600 code or as an option to the current release.

"This came together faster than we expected," Blair said. ■



**Lang says, "The people want IPX switching."**

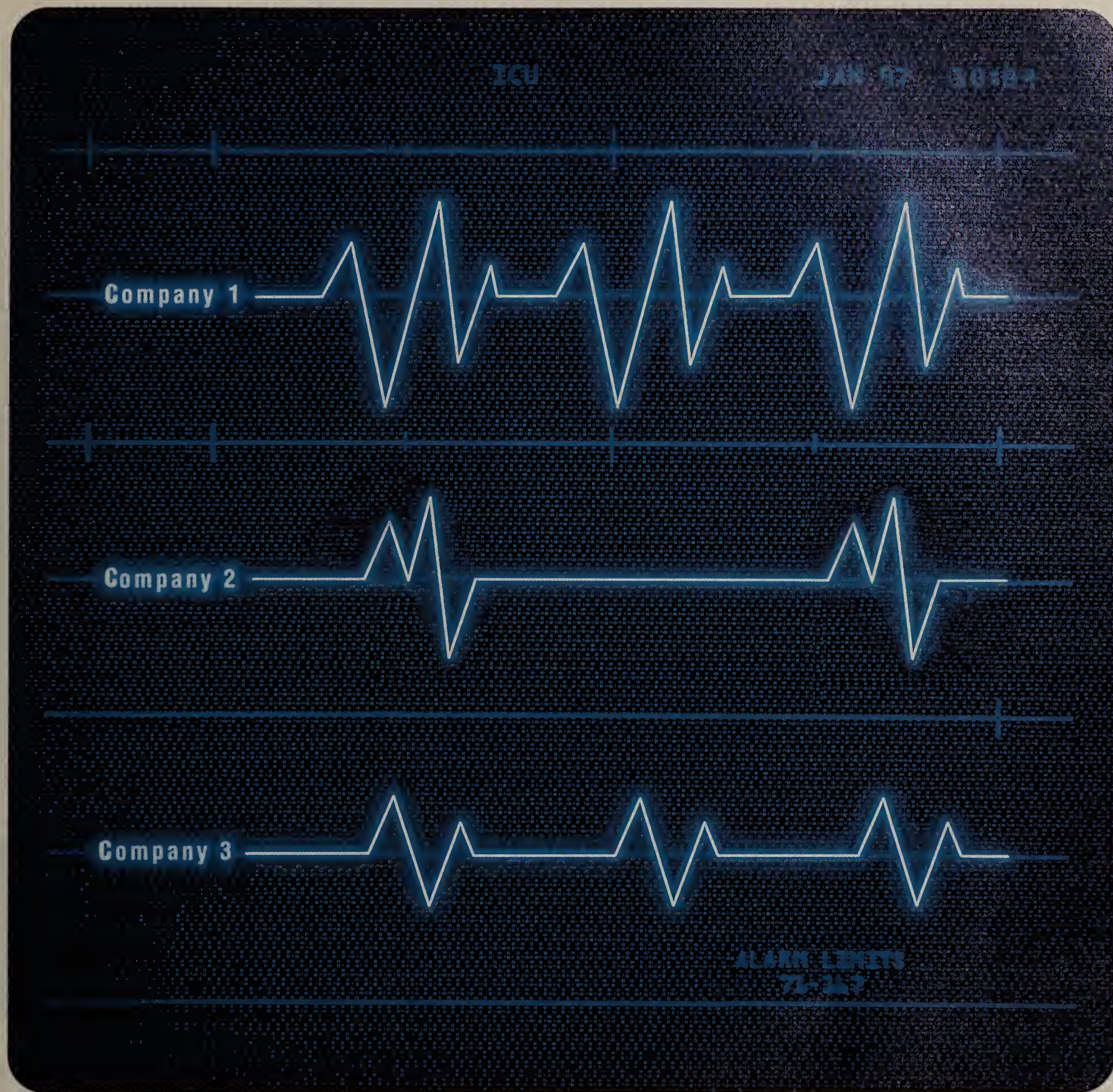
Check out Fusion for the broadcast of the Switching Showdown at ComNet, plus additional info:

- White papers on switching technology
- A previous story on 3Com's switching plans
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# IBM enhances Warp Server for Windows 95 and NT

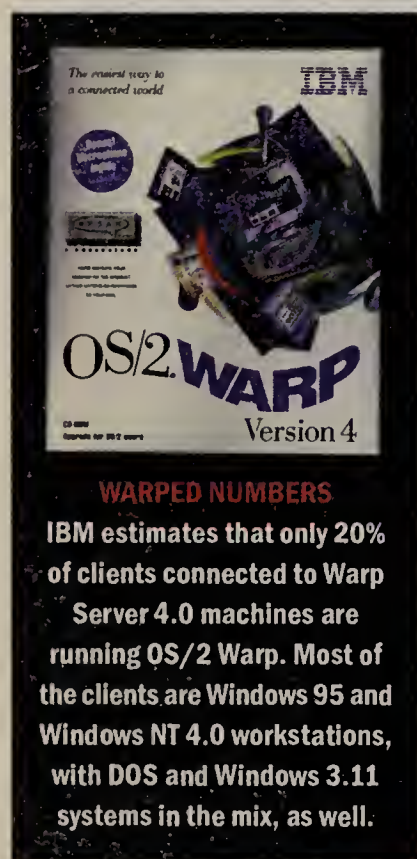
*Better connectivity and administration control offered.*

By Christine Burns  
Austin, Texas

IBM last week revamped its Windows 95 and NT workstation client software to ease access to Warp Server and give administrators more centralized control of those desktops.

In its first upgrade of its Win32 clients since IBM shipped Warp Server 4.0 a year ago, the client software gives both Windows 95 and Windows NT users a single logon to Warp Server.

Previously, users would log on to the PC and then complete a second logon process to access Warp Server resources. This new single logon process also supports mixed Warp Server and NT Server environments.



The clients also make it possible to store user profiles and systems policies on Warp Servers. With this information on the server, users can log on to the network from any Windows machine and retrieve their own desktop preferences.

System administrators can use this capability to ensure that Windows users retain access privileges to all of the same resources.

IBM also announced client code called the Network Neighborhood Enabler, which gives Windows users the ability to graphically view Warp Server resources via the Network Neighborhood desktop object.

With these stronger ties to

Warp Server, product manager Steven King said IBM has supplied the same level of connectivity to Windows clients as the company provides for its own OS/2 Warp clients.

"We have always considered Warp clients to be the premier clients for Warp Server," King said. This is the first time IBM has fully embraced these industry-standard Win32 clients in Warp Server networks, he added.

## Conceding defeat

Industry analysts contend that by shipping comparable Win32 connectivity, IBM is conceding defeat at the desktop.

"The desktop war is over, and this is a move to give people a reason not to rip out the OS/2 they have, which is mostly on the server side," said James Green, an analyst with Summit Strategies, Inc. in Boston.

The new Windows 95 client is available now as a free upgrade from the IBM Web site ([www.software.ibm.com/os/warp-server](http://www.software.ibm.com/os/warp-server)). Both the enhanced NT client and the Network Neighborhood Enabler are in beta and will be available early next month.

©IBM: (800) 426-3333.

# Sun powers up for Java Server Toolkit

By Ellen Messmer  
Mountain View, Calif.

Sun Microsystems, Inc. last week detailed its plans for a Java Server Toolkit (JST) that it will license to manufacturers interested in building Java servers which work with Sun's network computer, the JavaStation.

The JST, which Sun's JavaSoft division plans to have in beta around April, will include a framework for printing services, logon capability, file access, boot services, directory access, and administrative services for session tracking and user access. Sun hopes to have the JST ready by the time it makes its Java Web server available this spring.

"The Java Server Toolkit will let people build a new class of servers for the [network computer]," said Carole Amos, product line manager at JavaSoft's server group. She pointed out that developers currently are forced to write server services in C and C++ on Unix (which are platform-specific) to work with Sun's thin client, the JavaStation.

The NC needs to have access to a file system to download applets, and the JST will provide a generic way to do this, Amos said.

It remains unclear whether

the JST will work with other NCs, such as the one now in beta from Oracle Corp. Randy Brasche, marketing manager for Oracle's Network Computer, Inc. (NCI) division, said Sun has not told them what will be in the JST. "We need to work toward interoperability in NC servers," said Brasche, adding that industry is

*"Studio is so simple that nonprogrammers can build applets and applications by snapping in visual components."*

Joe Keller, director of product marketing, SunSoft



considering extending the baseline NC spec to include servers.

David Smith, consultant at Stamford, Conn.-based Gartner Group, Inc., said a common NC server specification is needed, but a standards body should do the defining. Smith said it would be hard to feel bullish about NCs until there are NC servers out and standards in place.

Sun was also busy on several other Java fronts last week, holding a conference for analysts on Sun's product direction and offering the first demo on a new

Java software development tool kit, called Java Studio.

"Studio is so simple that non-programmers can build applets and applications by snapping in visual components," said Joe Keller, SunSoft's director of product marketing, who added that the product will be out in beta next month. The Studio components are based on Sun's Java Beans specification. In theory, users can swap out components made with different vendors' tool kits as long as they are Beans-compatible.

And in a move that takes a clear swipe at Microsoft Corp., Sun posted on its Web site a manifesto detailing the requirements software vendors will have to comply with for the "100% Pure Java Initiative" it announced with partners Oracle, IBM, Netscape Communications Corp. and others last December. The goal of the program is to promote cross-platform interoperability of Java software.

The "100% Java" white paper ([www.sun.com](http://www.sun.com)) says users cannot put C or C++ code into Java applications, cannot perform native calls and must conform to the Core Java spec (see graphic).

Microsoft Corp.'s ActiveX is specifically verboten, except if it is employed as a Java Bean component. ■

# 'Unbreakable' encryption set for export

By Ellen Messmer  
Washington, D.C.

The U.S. Department of Commerce last week gave three companies permission to ship 56-bit Data Encryption Standard (DES) encryption without key recovery, as long as the vendors promise to add key recovery after six months.

With that promise made, Cylink Corp., Digital Equipment Corp. and Trusted Information Systems, Inc. (TIS) can all export products with 56-bit encryption to anyone in a foreign country friendly to the U.S. Until now, only banks could hope to get DES products — once classified as munitions products — out of the country and did so by pleading with the State Department.

Under the key recovery plan, U.S. law enforcement can go to a "data recovery" center to have user data decrypted.

The DES export approvals are good for six months, with possible renewal for up to two years.

But few vendors expect the government to allow the export of strong encryption without data recovery at that point.

## Upcoming legislation

The Clinton administration is expected to soon unveil legislation to regulate these data recovery centers, which will be holding encryption keys or providing decryption services.

The government will propose to place a \$100,000 cap on liability associated with holding the encryption keys, protecting them from massive lawsuits if keys are lost or stolen. The legislation will dictate operating rules — for example, operators must be bonded. The Clinton administration will allow operation of nonlicensed data recovery centers, but they will not be protected by the liability cap.

Only two organizations have officially been approved by the Commerce Department as data recovery centers, though not

under any licensing regime. One is TIS as a third-party center. The other is Netherlands-based TIS firewall customer Royal Dutch Shell Co. in the Netherlands, which has an agreement that lets Dutch law enforcement obtain encryption keys for U.S. authorities, if needed.

In the U.S., SourceFile and Data Securities International, Inc. appear close to getting Commerce Department approval as key-holding third parties. Industry sources say there will soon be third-party data recovery centers in France, Germany, the Netherlands, Switzerland and the U.K., where country authorities will cooperate internationally.

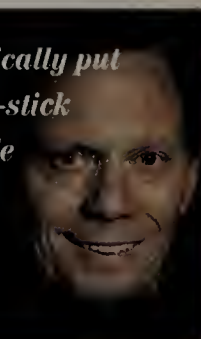
## TIS undertakings

TIS is in negotiations with the National Computing Centre, Ltd. in the U.K. and Philips Crypto BV in the Netherlands.

TIS President Steve Walker,

*"The government basically put together a carrot-and-stick approach to get people to put key recovery in their products."*

Cylink's Chuck Williams



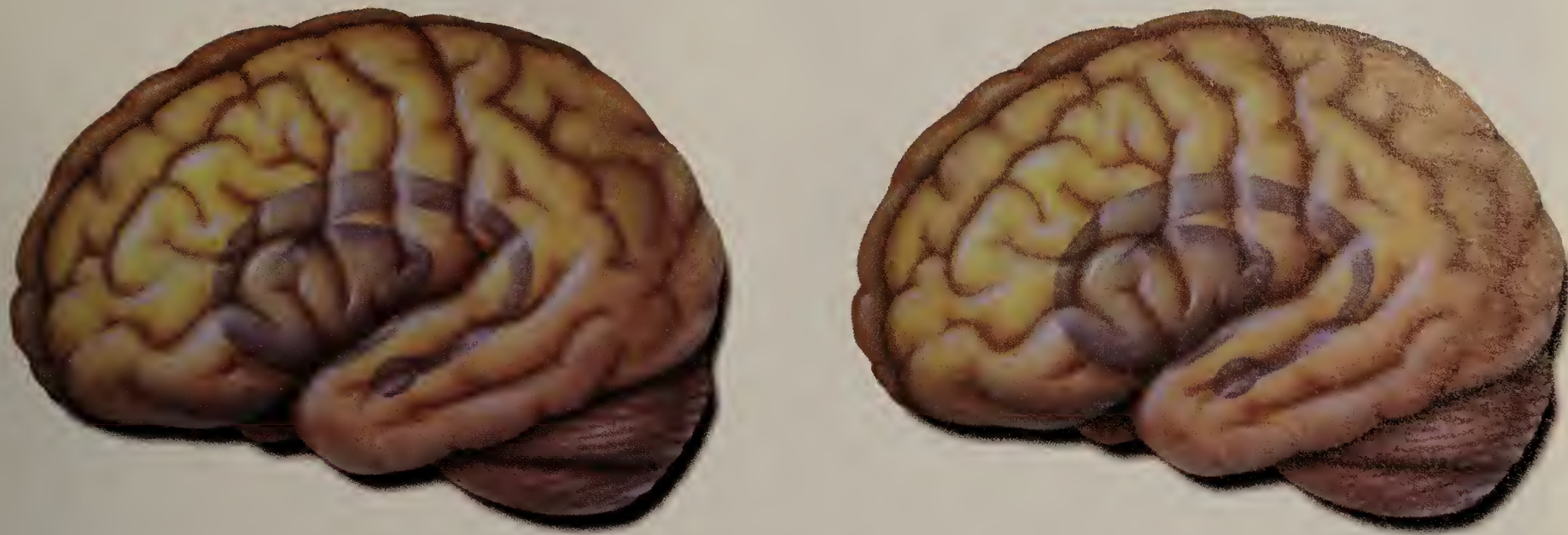
who said IBM, Hewlett-Packard Co. and others have licensed the TIS patented RecoverKey technology, noted that products with data recovery encryption will not work until registered with a data recovery center.

The government may soon broaden its carrot-and-stick approach by even allowing Triple-DES products to ship if vendors sign up for key recovery.

Chuck Williams, Cylink chief scientist, said quite a few of his company's Fortune 1,000 customers are fiercely opposed to the government's key recovery plans, saying Cylink has to follow this path to survive because the firm depends on international exports for its revenues. ■



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## Switching

Continued from page 1

switched networks.

The new SecureFast software release was described by company officials last week during an exclusive briefing here at ComNet '97. New capabilities include:

- Layer 3 switching of AppleTalk and NETBIOS protocols.
- PBX-like policy features, such as the ability to restrict Internet access to certain times of the day.
- The ability to monitor usage of expensive WAN links.

The features build on the current SecureFast software release, which has been shipping since the summer. It supports IP and IPX switching, traffic load balancing, and automated adds, moves and changes. In addition, the current release features duplicate IP address discovery and port mirroring capabilities.

SecureFast also works with the Spectrum network management platform, something that sets Cabletron apart from competitors, one analyst said.



Cabletron's Waterhouse says his firm will offer enhanced protocol support for SecureFast.

extended to support other vendors' IP switching gear.

"Spectrum can manage Cabletron's SecureFast-enabled switches as well as other vendors' Layer 2 devices," said Trent Waterhouse, Cabletron's LAN switching market manager. "Now we're looking into whether Spectrum could manage other vendors' Layer 3 switches, as well."

But some observers warned that SecureFast is a proprietary technology and buyers should beware. Because there are no Layer 3 frame switching standards, users could run into problems when they try to integrate their legacy systems into an ATM network.

But it is unfair to label Cabletron as more proprietary than any other vendor, MacAskill said. "Why does Cabletron have to wear the proprietary label when everybody else is doing the same thing?" he asked. "3Com's Fast IP is proprietary, Cisco's Tag Switching is proprietary, and [Ipsilon Networks, Inc.'s] IP switching technology is based on proprietary protocols. So they're all pretty much in the same boat."

Cabletron plans to offer AppleTalk and NETBIOS support this summer, and will ship the enhanced policy features by year-end. SecureFast software upgrade pricing has not been set.

Separately, FORE's spring announcement is aimed at making its PowerHub 7000 more competitive with products such as Bay's System 5000, Cabletron's MMAC-Plus and Cisco's Catalyst 5000, one industry analyst said.

## More from FORE

It also will make clearer that FORE offers more than just ATM products.

"As soon as you hear the name 'FORE Systems,' you automatically think ATM," MacAskill said. "By bulking up the PowerHub, FORE is hoping to show users that it is a viable LAN switch company."

FORE will roll out a switching engine module, dubbed the Packet Engine 2, which will double the backplane capacity of the Power 7000 from 1.6G to 3.2G bit/sec. Also, the company plans to add five new slots to the cur-

rent 10-slot chassis.

In addition, FORE will announce three Fast Ethernet switching hub modules for the PowerHub 7000 backbone switch and PowerHub 6000 departmental switch.

For the 7000, FORE will offer a 16-port Fast Ethernet module that is divided into two 100M bit/sec switch segments. And for the 6000, FORE will provide a 24-port Fast Ethernet module that splits into two 12-port switch segments as well as a

12-port Fast Ethernet repeater module. The new Fast Ethernet modules will ship this summer, according to Jim Goede, product-line manager at FORE.

Previously, FORE offered only a six-port switched Fast Ethernet module for the PowerHub line.

Since buying Alantec Corp. at the end of 1995, FORE has been using the PowerHub mostly as an adjunct into ATM backbones, MacAskill said. With the PowerHub enhancements, he said FORE is trying to win some LAN switching business that is not necessarily always tied to ATM.

But FORE is still touting its strategy to deploy ATM at the network core. And it seems as if customers agree, since 80% of the PowerHub boxes are going out the door with a 155M bit/sec ATM uplink port.

And what about multilayer switching support? The PowerHub switches support IP, IPX, DECnet and AppleTalk routing. FORE also plans to support the ATM Forum's emerging Multi-Protocol over ATM standard. Customers will be able to add MPOA support via a software upgrade that will be available by the end of the third quarter.

©Cabletron: (603) 332-9400; FORE: (412) 772-6600.



## Chambers: Cisco's router problems just growing pains

By Jim Duffy

Washington, D.C.

Cisco Systems, Inc. is offering no excuses for Internet instability and expensive product upgrades.

Users should expect to incur "some bumps along the way" when using the Internet for electronic commerce, said John Chambers, Cisco's president and chief executive officer. Likewise, users purchasing stand-alone Cisco products with little architectural compatibility to other Cisco gear should expect a forklift upgrade two or three years later.

Chambers spoke briefly with *Network World* following a keynote address on networking for business scalability at ComNet '97 here.

Internet organizations have implicated Cisco routers as the root of Internet instability, claiming they choke links with router administration traffic that degrade performance. Asked how he balances this perception with his call for a global networked economy — Cisco routers dominate Internet points of presence — Chambers drew parallels to the mainframe and telephone businesses.

"What customers would say is... we want it to be completely bulletproof, we want it to be like the mainframe and the telephone," Chambers said. "But the telephone took 60 years to

get to where we are, and the mainframe, even in the early and mid-'70s, was still very unstable as far as networking.

"People want all the functionality, but as you get on the leading or bleeding edge, then you're going to get some bumps along the way," he said. "You suddenly see traffic jams you hadn't anticipated when you designed the products."

Customers should also be aware that products they buy may become obsolete in two or three years and require an expensive and disruptive upgrade, Chambers said. Cisco users are experiencing that now with the Cisco 7000 series router and LightStream 2020 ATM switch. Some expect to repeat it when Cisco ships the oft-rumored Catalyst 5500 LAN switch.

"You have to be realistic," Chambers said. "Products are going to change; the life cycles are going to be two to three, not five to seven, years. The ability to put voice integration, multimedia, things of that type might be very limited if [products] are three or four years old."

To alleviate the unpleasant surprise of a suddenly obsolete product, Cisco is trying to make customers aware of the implications of their purchase and to develop products that are architecturally alike as opposed to distinct, or "stand-alone," Chambers said. ■



Chambers isn't offering any excuses.

## FORE BULKS UP LAN SWITCH

FORE will enhance its PowerHub 7000 LAN switching hub by offering Fast Ethernet switch modules, adding five new slots to the current 10-slot chassis and doubling the backplane capacity to 3.2G bit/sec.



"IP switches are offering things like traffic control, bandwidth management and the ability to use virtual LANs effectively, all of which are ultimately network management issues rather than pure traffic functions," said Skip MacAskill, senior research analyst at Gartner Group, Inc., a consultancy based in Stamford, Conn. "By leveraging Spectrum, Cabletron tells a very strong story by layering a lot of network management into its LAN traffic capabilities."

3Com Corp., Bay Networks, Inc. and Cisco Systems, Inc. are mostly focused on element management, MacAskill said. "But Cisco is probably going to try to join Cabletron in the enterprise management market by working with HP, so Cisco sees the value here," he said.

In fact, Cabletron is evaluating whether Spectrum can be

## No sign of token-ring switch module

Cabletron Systems, Inc. is not just late delivering the SmartSwitch token-ring module for its high-end hub; the company may not deliver it at all.

At least that's what Trent Waterhouse, LAN switching market manager at Cabletron, told *Network World* last week. Cabletron previously announced it would ship a token-ring desktop switch module for its Multi Media Access Center (MMAC)-Plus chassis by the end of 1996, but there's been no sign of it yet (*NW*, Jan. 15, 1996, page 1).

Cabletron is now in the midst of reevaluating its entire token-ring switch strategy. And it seems customers may never see the token-ring switch module, which was supposed to offer about 20

switched token-ring ports and provide a forwarding rate of 750,000 packet/sec.

"We are questioning whether token-ring desktop switching will ever materialize since Fast Ethernet is infringing on that market," Waterhouse said. "We already offer our ATX 20-port token-ring switch for backbone ring-to-ring connections, which may be all we need."

If Cabletron abandons development of the SmartSwitch module, its token-ring switch customers will not be able to use the company's SecureFast virtual networking capabilities (see story, page 1). The existing ATX switch, which came from the Standard Microsystems Corp. acquisition, does not support SecureFast.

— Jodi Cohen



# WANs & Internetworking

**Covering:** Network Architectures and Management • Routers • Muxes, Remote Access Gear, Modems, PBXs and other CPE • Mobile Computing Products

## Briefs

■ **Cabletron Systems, Inc.** has added a **frame relay** management application to its Spectrum management platform. **Frame Relay Manager** monitors frame relay circuit bandwidth usage and costs.

It builds a topological view of all frame relay interfaces and their individual circuits, and it can manage any frame relay access device that supports the RFC 1315 Management Information Base, according to Cabletron.

Frame Relay Manager requires Spectrum 4.0, which costs about \$15,000. It will be available in the second quarter.

Cabletron: (603) 332-9400.

■ **Alltel Corp.** has announced plans to launch a network management service for **Cisco Systems, Inc. router networks**. The Net-Know-How service will provide baseline, analysis, reporting and configuration recommendations, according to Alltel. It will encompass WAN connectivity, network protocols, routing protocols and implementation verification.

The service will be rolled out March 3 and priced on an individual contract basis.

Alltel: (972) 866-1400.

■ **Amati Communications Corp. and Sourcecom Corp.** have announced plans to integrate their respective Asymmetrical Digital Subscriber Line devices, the Allegro ADSL concentrator and the BANC 6000 DSL access multiplexer. Further details about the combined offering were not available.



Amati: (408) 879-2000; Sourcecom: (818) 735-3500.

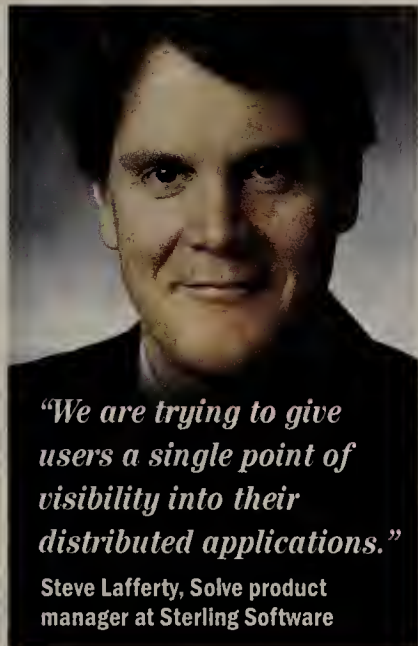
## Sterling apps manage business resources

*Applications reduce operating costs, enhance net management.*

**By Michael Cooney**  
Reston, Va.

Sterling Software, Inc. last week announced software designed to help users manage widely distributed applications.

The two new applications — Solve:Operations for Hewlett-Packard Co.'s OpenView and Solve:Operations for IBM's NetView for AIX, now known as TME 10 — are said to reduce operating costs by allowing users to get a handle on how network outages and application bottlenecks affect their business applications.



The software runs as an application on NetView or OpenView platforms and is the latest component of Sterling's suite of Solve software tools for mainframe and server-based management platforms.

The key feature of Solve:Operations tools is they let network administrators group and monitor users according to their work or application usage, such as billing, inventory or payroll.

If there is an outage or bottleneck, automation routines can be invoked or administrators can take action to correct a problem.

"The idea is to get users concentrating more time on the network problems that have the

greatest impact to the company and its bottom line," said Steve Lafferty, Solve product manager at Sterling. "For example, a catalog sales organization could restore its order entry and fulfillment departments before it would restore a less critical function."

The new Solve:Operations application automatically discovers network resources, including applications and communications devices and lines. The application works by collecting data from Sterling agents residing on a variety of platforms,

from mainframes to individual workstations. In addition, agents from third-party companies can feed data to the Solve application.

Events and status messages from those agents are forwarded to the application and into the OpenView or NetView enterprise management platform.

Together, these tools provide users with a single view of the operations environment from a single console, according to Dennis Powell, product manager at Sterling.

Users can customize the Solve data to track particular workgroups or applications, Powell said.

In the past, applications and network infrastructure details were tracked on separate man-

*"Administrators can now prioritize the management of the strategic applications that run their businesses."*

**Dennis Powell,**  
product manager at  
Sterling Software



agement systems or distributed systems, making it difficult to identify, track and resolve problems, Powell said.

Solve:Operations for OpenView and Solve:Operations for NetView for AIX will be available this month for prices ranging from \$15,000 to \$35,000, depending on the number of concurrent users.

©Sterling: (800) 247-5163.

## Network layer switching

### Toshiba, RND raise stakes in IP switching

**By Jim Duffy**

Two more companies have leaped in to the burgeoning field of network layer switching.

Toshiba Corp. unveiled the CSR 5300, an IP switch designed to handle high volumes of Internet and intranet traffic. And RND Networks, Inc. rolled out PowerIP, a Layer 3 switch for establishing intranet host-to-host communications at full aggregate backbone speeds.

To build the CSR 5300, Toshiba integrated its Cell Switch Router (CSR) technology with an ATM switch for high-speed IP packet switching. CSR sets up cut-through paths through the network that avoid the hop-by-hop processing delays — the bottlenecks — of conventional routers.

The CSR 5300 features 14 155M bit/sec ATM OC-3 ports that support 1,024 virtual circuit sessions. It forwards 4.2 million packet/sec and complies with ATM User-Network Interface (UNI) 3.0 and 3.1 specifications.

It also supports the Routing Information Protocol (RIP), Open Shortest Path First (OSPF) protocol, the Border Gateway Protocol, the Distance Vector

Multicast Routing Protocol and Ipsilon Networks, Inc.'s Ipsilon Flow Management Protocol.

The switch's UNI support makes it interoperable with other ATM switches, Toshiba claimed.

CSR technology includes a dual-mode approach to establishing cut-through paths, according to Toshiba. One method is flow-driven, the other topology-driven.



**Product:** PowerIP Ethernet

**Function:** Cut-through routing for IP

**Available:** March

**Cost:** \$17,000

In flow-driven switching, the cut-through path is established on demand, according to the appearance of the packet low at the node. Topology-driven switching establishes cut-through forwarding in advance, according to the topology of

the network.

Toshiba has not yet determined pricing and availability for CSR5300.

#### RND's offerings

RND's PowerIP Ethernet switches come in two configurations: one with 10M or 100M bit/sec ports, or a 20-port version that is configured with 16 10M and four 100M bit/sec ports. Each port can run in half- or full-duplex mode, according to RND.

PowerIP learns the topology of the network, calculates the fastest route between hosts and opens a virtual path, RND said. Paths can be permanent or session-based.

Once a path is established, all packet forwarding is performed at the switching layer.

In addition to providing cut-through routing for IP, PowerIP provides conventional routing for IPX.

It supports RIP, OSPF, IPX RIP and the Service Advertisement Protocol.

PowerIP costs \$17,000 and will be available in March.

©Toshiba: (714) 587-6200; RND: (201) 512-9771.



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**W R I G H T • L I N E**  
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**Covering:** Local and Long-Distance Services • Value-Added Networks • Cable, Satellite and Wireless Networks • Regulatory Affairs • Carrier-Based Internet Services

## Briefs

■ **The Department of Defense** has awarded **AT&T** a long-awaited transmission contract for the **Defense Information Systems Network (DISN)**. **AT&T** will provide the **DISN's OC-3 (155M bit/sec) Synchronous Optical Network (SONET)** nationwide backbone, plus **T-3 and T-1 access circuits** — many of them subcontracted to local exchange carriers. The selection is notable because **AT&T's nationwide SONET deployment lags those of Sprint Corp. and MCI Communications Corp.**, analysts said. But **AT&T** reportedly bid substantially below its rivals for the contract, potentially worth \$5 billion over nine years.

■ **Start-up Latic Communications** in Rockville, Md., last week announced an **Internet voice service** that will let users call Tokyo for 15 cents per minute

### INTERNET VOICE SERVICE

Type of service	Price per minute
Domestic	5 to 6 cents
To the Pacific Rim	15 cents

using a traditional touch-tone telephone. **Latic** initially will offer international service to the Pacific Rim and then branch out later this year.

**Latic:** (301) 340-1688.

■ Another set of big users has weighed in with the **Federal Communications Commission**, asking the agency to extend its order abolishing domestic long-distance tariffs to international services by September.

Attorneys for **ABC, Inc., CBS, Inc., National Broadcasting Co. and Turner Broadcasting System, Inc.** told the **FCC** that putting domestic services under ordinary contracts while leaving international services under tariff will cause "unnecessary delays and confusion."

Representatives for the banking, oil and other industries earlier petitioned the **FCC** for such action (NW, Jan. 27, page 17).

## MCI services to give 'Net a stronger voice

By Denise Pappalardo  
Washington, D.C.

**MCI Communications Corp.** has laid out its vision for integrating voice networks and the 'Net.

The carrier's new Vault architecture will serve as the foundation for a set of offerings dubbed V-Class services. The company last week demonstrated at ComNet '97 here the first two services: **Internet Call Center**, which combines Web site access with IP telephony; and **directlineMCI**, an enhanced edition of MCI's Follow Me call routing service.

**Internet Call Center** will support call centers that let end users contact a customer service agent via the Internet and simultaneously establish an IP voice call over one phone line. Customers simply click on an icon that connects them to a representative. The representative can answer questions or direct the customer to another Web page with more information.

Competitive solutions from **AT&T** and **Sprint Corp.** require users to have two phone lines, and the return voice call is made over a traditional public switched telephone network, **MCI** officials claimed.

Check out more resources online.

- Financials and stories about MCI
- A story on how AT&T is combining data and voice services

Enter the number to the right in the DocFinder box on the home page.

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**MCI** will support its application through proprietary software interfaces deployed at its central office sites that connect its voice network to the Internet. In addition to the Internet interfaces, **MCI** will establish gateway devices that translate between analog voice and IP traffic, said **Vinton Cerf**, senior vice presi-

dent for Internet architecture and engineering at **MCI**.

Citing a distinct lack of detail, analysts questioned the firmness of **MCI's** plans. The company did not disclose details of its network architecture, availability of services or pricing.

"It sounds to me like **MCI** is grandstanding," said **Thomas Nolle**, president of **CIMI Corp.**, a Voorhees, N.J., consultancy.

Users liked the idea but questioned the benefits. "That would be cool, but I don't think it would make any difference on our side," said **Steve Jones**, voice communications specialist at **SPS Payment Systems, Inc.**, a Riverwoods, Ill., private-label credit card company. "It's a novelty. It would be slower for people to access us through a PC link."

**SPS Payment Systems** oper-

### MCI INTEGRATES VOICE AND INTERNET SERVICES

**MCI's V-Class family of services will combine the benefits of the Internet and public switched telephone network.**

Service	Description	Pricing	Availability
Internet Call Center	Users can simultaneously contact call center agents via the Internet and establish a voice call over a single telephone line.	Not available	Soon
directlineMCI	Customers of Follow Me, MCI's telephone number routing service, will now be able to update their contact information over the Internet. Previously, customers had to call a customer service representative.	\$9.95-\$19.90 per month flat fee plus usage charges	Now

ates a call center mainly to support clients who want to establish new accounts, need customer service assistance or require payment information. "We have enough 800 numbers to accommodate people calling in, and it's a toll-free call," **Jones** said.

As part of its Vault announce-

ment, **MCI** unveiled an upgraded edition of its **directlineMCI** call routing application. Customers of **MCI's Follow Me** service can now activate voice mail and customize their pagers via the Internet rather than calling customer service agents to institute changes. ■

## LCI offers PC access to frame circuit manipulation

By David Rohde  
Washington, D.C.

The nation's sixth-largest long-distance carrier wants you to be able to change frame relay committed information rates (CIR) right from your PC.

At **ComNet '97** last week, **LCI International, Inc.** introduced a PC version of its **Authority Network Management System (NMS)**. The first frame relay management system to offer real-time CIR reconfiguration, **Authority NMS** previously was available only for **Sun Microsystems, Inc. SPARCstations**.

Now customers with **Windows-based** machines running **Authority NMS** can tie the management platform via a permanent virtual circuit (PVC) to **LCI's MainStreet 4602**, a net management unit from **Newbridge Networks, Inc.**

Users then can increase or decrease the CIRs on PVCs supported by the carrier's **Newbridge** frame relay switches in increments of 8K bit/sec (see graphic). The carrier provisions the PVCs asymmetrically, so users can set CIRs running

higher in one direction than the other, based on traffic patterns.

CIRs indicate the maximum speed at which users can push through data frames with the discard/eligible bit turned off. Above the CIR, users can send data bursts as high as the speed of the port on the carrier switch, but at a risk of the frames being dropped if network congestion occurs. Like most carriers, **LCI** charges extra for higher CIRs, so

it is in users' interest to set the CIR as low as is prudent to accommodate changing traffic patterns.

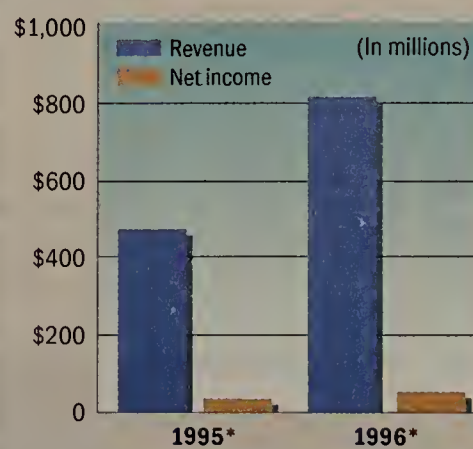
The initial charge for the PC-based **Authority NMS** is \$2,000, plus a monthly charge of \$1,000, but that eliminates the need for expensive workstation installation, according to **Scott Booth**, **LCI's** director of large account marketing.

For users who want to monitor PVC usage but do not require real-time CIR reconfiguration, **LCI** also is testing a Web browser interface into frame relay circuit monitoring.

Demonstrated at **ComNet** and due for general release in April, the Web interface is strictly a reporting tool to help users get a handle on their optimum CIRs and other settings, **Booth** said. Users of the new tool then can simply call the carrier for their reconfiguration needs. ■

### ONWARD AND UPWARD

No. 6 long-distance carrier **LCI International** is enjoying a big growth spurt.



\*Figures are for the first nine months.  
SOURCE: LCI, MCLEAN, VA.



## WAN MONITOR

### AT&T's coming-out party for SVCs

**I**t is pretty amazing, but for the second time in the past six months, AT&T has been first to market with a new fast-packet service.

The first was a central office-based SNA service, and now the carrier has introduced ATM switched virtual circuits (SVC). AT&T never used to be first with

frame relay or ATM services and technology enhancements, so this certainly shows a cultural shift to gain market leadership — not just in terms of share, but also in terms of innovation.

So now we finally have SVCs. We've been waiting for them since the year after frame relay services were born. In fact, customer demand for SVCs was high back

then, mostly because the majority of the industry confused them with dial access to framerelay.

Now we have that part straightened out, and we have dial access, though we don't have SVCs with frame relay.

SVCs, meanwhile, have been integral to the ATM specifications from the beginning. Most ATM customer equipment supports SVCs. And yet, until last week, we still didn't have any SVC service.

This is primarily because SVCs have been difficult for carriers to roll out. They have struggled with how to price SVCs, how to engineer the network to support them and how to bill them.

So now AT&T says, "Here they are, come 'n' get 'em." But at ComNet '97 last week, lots of people were asking, "Great, what do you use them for?"

Thanks in large part to ISDN, the idea of "technology push" has become a no-no. "Demand pull" is what's in vogue.

But guess what? Users can't "pull" a new product until they understand problems and applications addressed by it. And this usually doesn't happen until a product is available and early adopters start figuring out that the new capabilities can solve a problem better, cheaper or faster.

AT&T has taken the first step for all of us by making the product available. This doesn't necessarily make it a technology push; it just makes AT&T an early bird.

What's even more interesting is that we have pricing — and lots of it. The day before the announcement, you couldn't pull ATM pricing from AT&T or any other carrier without a set of needle-nosed pliers. With last week's announcement, we now have an available set of ATM prices.

From our perspective, SVCs will work well when the application is highly intermittent but the intervals are fairly far apart. So if the application is five seconds on and then five off throughout the business day, such as with some remote LAN interconnections, then a permanent virtual circuit may continue to be the best option — at least until SVC pricing is always less expensive than PVCs, regardless of utilization.

Not every network is a candidate for ATM, and fewer still for SVCs over ATM. But at least now we can start understanding the applications and environments for which SVCs will make things better, cheaper and faster.

*Briere is president and Heckart is director of broadband with TeleChoice, Inc., a consultancy in Verona, N.J. They can be reached at dbriere@telechoice.com and checkart@telechoice.com.*

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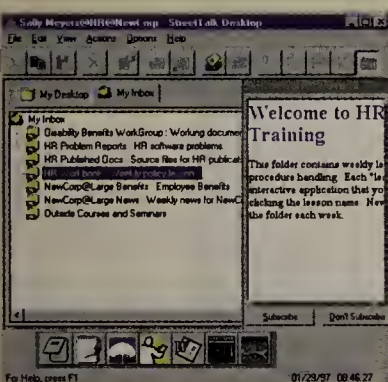


# Local Networks

**Covering:** Servers • Operating systems • LAN management  
Hubs • Switches • Adapters and other equipment

## Briefs

■ **Banyan Systems, Inc.** last week rolled out directory-enabled client software that lets users easily share networked information. **StreetTalk Desktop** sits



on a 32-bit machine and lets users create public folders, which comprise pointers to personal and network files, and define who can access the shared folders.

When the user clicks on the pointer, the underlying StreetTalk 7.0 directory service provides transparent access to the information regardless of its location. StreetTalk Desktop is available now priced starting at \$390 for a 10-user pack.

Banyan: (508) 898-1000.

■ **Citrix Systems, Inc.** is prepping a new version of its **Windows NT Server-based multiuser software** server geared for large networks.

WinFrame 2.0, expected to ship by midyear, will include the enhanced remote access features of the Windows NT 4.0 kernel as well as support clustering and load balancing between servers.

Citrix: (954) 267-3000.

■ **Compaq Computer Corp.** last week announced **price cuts** on its ProSignia and ProLiant servers. ProLiant 5000 models with one or two 200-MHz Pentium Pro processors dropped by as much as 11%, depending on configuration, and start at \$13,920. ProLiant 5000 models with 166-MHz Pentium Pros dropped to a starting price of \$10,970. ProSignia 300 models, which can be configured with one 90-, 120- or 150-MHz Pentium processor, were reduced in price from 9% to 20%.

## Management tool puts focus on LAN costs

*Client/Server Solution Advisor helps health care firm.*

By Charles Bruno

Had Mitchell Sledge not stumbled onto a relatively new tool for measuring total cost of ownership for enterprisewide LANs, he might still be crunching numbers on his spreadsheet.

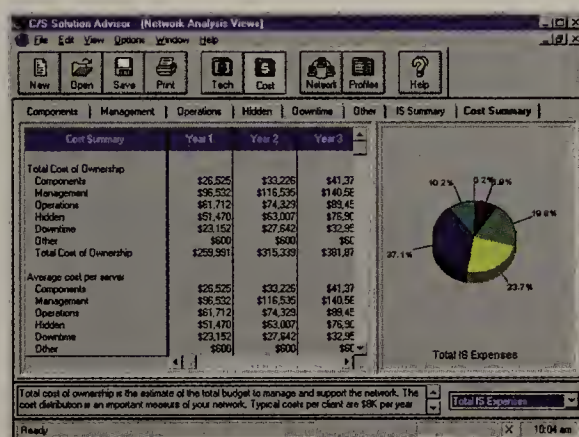
Sledge, a senior technical systems consultant in the Advanced Technology Center at United Health Care in Minnetonka, Minn., discovered Interpose, Inc.'s Client/Server Solution Advisor while reading *Network World* last fall. After contacting the vendor, he signed on as a prerelease user of Version 2.0 of the software, which has enabled United Health Care to determine baseline operating costs for its enterprisewide NetWare and Windows NT Server LANs.

Version 2.0, announced recently, adds total-cost-of-ownership analysis and net modeling for NT Server environments to support for NetWare LANs. The software also now automatically discovers Windows 3.X and 95, DOS and Macintosh clients. In addition, it lets net managers import asset management databases from Tally Systems, Inc.'s NetCensus.

It provides net managers with a good starting point to develop baseline data on actual costs that you can compare against industry averages programmed into the software, Sledge said.

In addition to the hardware and software changes, C/S Solution Advisor now comes with a built-in staff profile to predict personnel requirements as the net grows. Interpose also added a network upgrade calculation. This documents — for each new asset — the required hardware and software purchase requirements over time due to planned growth or migrations.

On the analytical side, Interpose has added the capability to



Interpose's C/S Solution Advisor helps net managers determine baseline operating costs for LANs and each server.

specify asset additions, deletions and growth, as well as report on upgrade and migration plans over time. And the software now can handle the concept of a virtual network that lets you model assets over a specified analysis period. Further, you can now organize network assets into logical groupings, such as departments and cost centers.

"We made these changes because network [executives] need a tool that can model changes from a cost standpoint to give you an accurate baseline measurement and return-on-investment projections," said Tom Pisello, president and chief executive officer of the Altamonte Springs, Fla., start-up.

The software upgrade has made a world of difference for Sledge and United Health Care. The company has been using C/S Solution Advisor to determine "where in our net the greatest costs are derived from,"

Sledge said. Its goal, he said, is to determine baseline total cost of ownership for NetWare and NT Server devices. With those numbers in hand, the company can decide if it would save money by deploying an enterprisewide network management offering — specifically Tivoli Systems, Inc.'s TME environment.

Now that Sledge has his baseline numbers, he is piloting the Tivoli software for 90 days to develop additional cost data against which he can project any potential cost savings from using the net management tool.

Sledge said the C/S Solution Advisor has proved its worth because its abilities extend far beyond baselining. For instance, he said, the tool lets him project downtime costs in the event a



Interpose's Pisello says his company's tool helps net managers better determine return on investments.

server crashes. "I can show how valuable the data is that resides on these servers," Sledge said.

C/S Solution Advisor costs from \$495 to \$9,995, depending on the number of network assets to be analyzed and modeled.

©Interpose: (407) 260-5551.

## No more networked toasters?

By Christine Burns  
Orem, Utah

Novell, Inc. has reorganized its efforts to network-enable all types of appliances — from fax machines to toasters.

The company has disbanded its 5-year-old Novell Embedded Systems Technology (NEST) division and relegated its duties to other business units. Under the new plan, further NEST development will focus on integration with flagship products such as IntranetWare.

"We are taking what we have learned in the embedded space and putting it back into the core development groups," said Rob Hicks, general manager of the NEST division.

NEST technologies, such as fax routing and embedded software for office equipment, will fall under Novell's Information Access Division, which develops and markets IntranetWare. Novell is seeking partners to push embedded services into the consumer products market. To date, Novell has shipped three developers' kits that have enabled manufacturers to produce 200 NEST-

enabled devices.

The firm has been criticized for expanding its NEST effort into the home consumer arena. "Novell wasted a lot of time talking about turning toasters into network devices. It's good to see them close that conversation," said John Oltsik, an analyst with Forrester Research, Inc. in Cambridge, Mass. ■

### NOVELL REEVALUATES NEST

Novell's Embedded Systems Technology (NEST) integrates home and office appliances and devices with Novell Directory Services, making them accessible via the underlying network services.

Date	Event
April 1992	Novell announces NEST initiative.
February 1995	First NEST developers' kit ships to OEM partners. Novell predicts one billion networked appliances by the year 2000.
March 1996	Novell announces that 75 OEM partners have licensed NEST for use in 200 products.
September 1996	NEST developers' kit for office-specific products ships. New Novell President Joe Marengi flattens corporate management structure to refocus on core business.
December 1996	Novell reports one million NEST-enabled devices are in use.
February 1997	Novell disbands Embedded Systems Division.

**NetworkWorld**

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## FIRE WINDS

## Beware of Internet telephony usage

One task I dreaded as a corporate IS manager was reading the telephone bill every month to see if anyone in

my department was misusing the phone system for personal long-distance calls. After adding a direct Internet connection

to our LAN, I gained responsibility for reviewing logs to see who might be making inappropriate use of the 'Net.

Maybe I had it easy.

Now end users can put long-distance voice calls and Internet calls together. Internet access, coupled with IP telephony software such as Microsoft Corp.'s NetMeeting, allows anyone connected to

the Internet to talk to anyone else connected to the Internet who has compatible IP telephony software.

Market research firm Killen & Associates predicts global voice/Internet services revenue will top \$63 billion by the year 2002, jumping from \$741 million this year.

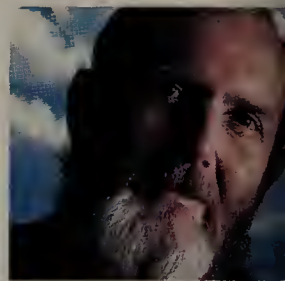
You might say, "Long-distance phone calls with no long-distance charges. Where's the downside?"

I'll tell you. Just think of the company time employees now can waste.

A high-speed connection helps the end user employ Internet phone applications. A modem running at 14.4K or even 28.8Kbit/sec makes for a choppy, hard-to-follow conversation: Think of one of your worst experiences with a speakerphone or cellular phone, then imagine something much worse.

Fortunately for the caller and unfortunately for you, many companies have T-1 or better Internet connectivity. By using his PC at work, and calling his friends and relatives over the company's Internet connection, an employee can make a call approaching the quality of a good speakerphone.

Microsoft tries to position NetMeeting as a business application, touting it as a way to replace gathering everyone in the same room. But one Microsoft marketing document explains the product like this: "NetMeeting melds the power of the PC with the global reach of the Internet to transform the everyday telephone call into a richer and more effective multimedia communication and collaboration experience. The built-in Internet phone support makes it easy for you to call family and friends around the world over the Internet."



Dave Kearns

## Tip of the week

Kansmen Corp. has introduced Little Brother, a Windows application that allows supervisors to measure whether their Internet and network resources are used productively. Administrators can now track who uses the Internet, where the users go and how long they stay online. For more information and an evaluation copy of Little Brother, check out [www.kansmen.com](http://www.kansmen.com).

There are many legitimate business uses for software applications such as NetMeeting — uses that can save your company time and money.

But watch out: The employee who wouldn't think of calling long distance on the company's phone system just might consider this "free" service OK to use on company time.

Kearns, a former network administrator, is a freelance writer and consultant in Austin, Texas. He can be reached at [dkearns@msn.com](mailto:dkearns@msn.com).

NetworkWorld  
TECHNICAL SEMINARSIP<sub>v6</sub>  
THE NEXT GENERATION  
FOR TCP/IP NETWORKS

The next generation of Internet Protocol — IPv6 — will significantly impact your TCP/IP network. The Internet explosion now requires new functions that go beyond the capabilities of the current Internet Protocol, or IP. These include enhanced security, support for real time traffic flows and expanded addressing capabilities. The addressing issue has been one of the most significant concerns as it was predicted that the Internet community would run out of available addresses, thus limiting the growth of this critical communication resource.

In late 1990, the Internet Engineering Task Force (IETF) initiated efforts to select a successor to the IP. In late 1993, the IETF formed the Internet Protocol — Next Generation (IPng) working group, which was chartered with investigating the various proposals, and recommending a course of action. The outcome of those efforts produced what is now known as IP version 6 (IPv6), which is currently being implemented by many vendors.

Perhaps more importantly, IP is the foundation of the TCP/IP protocol suite. Therefore if IP is revised, other protocols must be changed as well. The significance of this protocol revision extends to LANs, MAN and WAN transmission systems, as well as the upper layer protocols and application programming interfaces.

Whether you are a network manager, designer or software developer, this seminar, taught by internetworking expert Mark Miller, will provide you with information on the widespread ramifications of this new protocol. You will learn how to effectively plan and implement a successful, orderly transition.

Enterprise Network  
Management  
Understanding SNMP, SNMPv2 and RMON

With the explosive growth of enterprise internetworks, the need for integrated network management systems to help simplify management operations has never been greater. Today's enterprise network management systems need to manage thousands of elements — from the hardware devices all the way to the applications and processes running on these networks.

SNMP (Simple Network Management Protocol) has become the de facto standard for end-to-end enterprise network management. Recent enhancements to the SNMP-based technology, including SNMPv2, RMON2 and Web-based management tools, improve this popular system. With those enhancements, however, come additional challenges for the network manager.

This one-day, information-packed seminar, taught by internetworking expert Mark Miller, will help you understand the elements of an SNMP-based network management system, how to implement SNMP with your internetwork, plus the various enhancements such as the new message formats and improved error codes provided with SNMP version 2. You will learn about recent enhancements to the Remote Monitoring (RMON) network management architecture, known as RMON2, and the advantages of implementing RMON throughout your internetwork. In addition, you will see how SNMP is being used to manage broadband networks, including frame relay, SMDS and ATM.

You will also be introduced to the next generation of network management: Web-based tools that integrate SNMP and browser technology. This new technology consists of three components: network management software which runs on a Web server, proxy agents which operate on the managed devices, providing updates to the Web server, and a browser-equipped workstation that can access those management details from any location within the enterprise.

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## 12 TOPICS YOU DON'T WANT TO MISS!

1. Learn how the implementation of IPv6 will allow continued expansion of the global Internet
2. Explore the effects of IPv6 on other elements of your Internet or intranet architecture
3. Understand the limitations of the current Internet Protocol — IPv4
4. Discover key features of IPv6, including larger addresses and security
5. Learn details of the proposed IPng solutions: CATNIP, TUBA and SIPP
6. Understand the key functional and protocol enhancements incorporated into IPv6
7. Analyze the formats of the IPv6 packet header, Extension headers, ICMPv6 messages and Neighbor Discover messages, and others.
8. Gain detailed insights into how the IPv6 transition will affect other protocols, such as Ethernet, token ring, RIP and OSPF
9. Learn how to strategically plan your transition from IPv4 to IPv6
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## Briefs

### SAP AG'S 1996 FINANCIALS



Client/server application vendor **SAP AG** of Walldorf, Germany, has announced preliminary **record results** for its fiscal year ended Dec. 31. Revenue grew to \$2.4 billion, up 38% from 1995. Earnings were \$365 million, up 40% from the previous year.

Demand for SAP's R/3 System, an integrated set of core business applications, remained strong. Product sales were up 44% over sales in 1995, accounting for nearly two-thirds of all revenue.

**Hotmail Corp.** of Sunnyvale, Calif., last week announced Hotmail WebCourier, a service designed to enhance its **free E-mail** with news and specialized content such as CNET's News.com, Mercury Mail, NetGuide Live, Quote.com, Riddler and Slate. Users select the content they want to receive and it is delivered regularly to their Hotmail in-box. Hotmail is advertiser-supported and boasts 1.4 million users. WebCourier is expected to be available later this month.

Hotmail: (408) 222-7000.

**Pure Atria Corp.** of Sunnyvale, Calif., this week will release PurePerformix/Web, a product for **load-testing Web applications**. The software, intended for testing transaction-oriented Web applications, simulates the workloads of hundreds or thousands of Web users accessing the server software. The product is available now. Pricing starts at \$25,000.

Pure Atria: (408) 720-1600.

## Cadis brings organization to the Web

Revised authoring tool simplifies searches for useful intranet- and Internet-based data.

By John Cox  
Boulder, Colo.

The problem with putting a ton of information on your corporate Web is that most users only need about one ounce of it.

Cadis, Inc. this week will unveil EasyAuthor, an authoring tool that allows companies to quickly collect, organize and present information in Cadis' Krakatoa Web Catalog Publisher, which classifies complex data for fast search and retrieval via the Web.

Until now, programmers had to work with lower level tools to build the Web user interface and maintain the Krakatoa data.

The Windows 95-based EasyAuthor tool is part of Krakatoa Release 2.1, which also adds support for several electronic transaction systems, such as Open Market, Inc.'s OM-Transact.

Krakatoa combines an object database with Cadis' search technology, which lets users organize vast quantities of Web data into categories and subcategories, and then associate features or attributes with each. Users with PC or Java clients work within this hierarchy to sift quickly through categories and attributes to find what they want.

EasyAuthor complements the Krakatoa engine with graphical tools aimed at business end users instead of programmers.

"With EasyAuthor, you're forming the shape of the [catalog's] content — what the Web user sees and interacts with," said Bruce Jacquemard, vice president of Cadis' Internet division.

### Wizards everywhere

EasyAuthor's Import Wizard lets end users map data from other databases into categories and attributes created in the Krakatoa catalog (see graphic). A set of simple APIs lets programmers trigger actions — such as accessing a Web-based data sheet or placing an order — by other applications or databases once Web users have found the information they need.

The Query Wizard lets users create links to multiple Krakatoa

catalogs. Users search to find a product, then they can link to another catalog to find all the vendors that make the product.

The URL Wizard lets users create embedded Web links to other Web pages, to custom Common Gateway Interface programs and

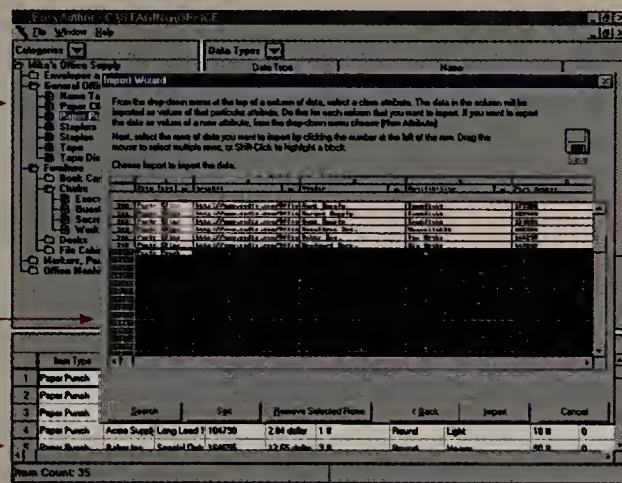
### Authoring tool bolsters Web search engine

Cadis' Krakatoa Web Catalog Publisher features a new authoring tool called EasyAuthor. EasyAuthor's Import Wizard lets users quickly select and format data to be included in a searchable Web catalog.

1. The user lays out the hierarchy of categories and subcategories.

2. The user then describes each category with a set of attributes.

3. Import Wizard converts ASCII files to the attributes.



## Tivoli, Taligent and Marimba back Domino/Notes

By Michael Cooney  
and Sari Kalin  
Orlando, Fla.

IBM subsidiaries Tivoli Systems, Inc. and Taligent, Inc. both introduced products for Domino/Notes customers at last month's Lotusphere '97 conference here.

Tivoli announced a TME 10 Module for Domino/Notes that will help users install, monitor and administer large distributed Domino/Notes environments. TME 10 is Tivoli's enterprise system and network management package.

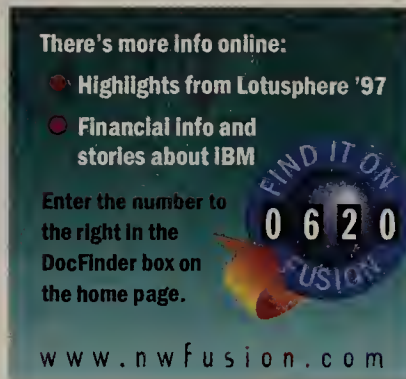
The TME 10 Module for Domino/Notes automates the distribution and configuration of remote Notes clients, controls access to servers, and monitors Notes application components for performance and availability.

Users reacted favorably.

"We are not going to grow our IS staff to build our Notes environment, so it is extremely important we have tools to centrally manage and install Notes and Domino," said Cindy Hadden, director of Administrative

Information Services at Louisiana State University.

The Tivoli software will be available next month and is priced at \$500 per server and \$25 per client.



Separately, object-oriented software vendor Taligent has developed a new client for Notes and Domino databases that aims to make it easier for project teams to work together.

The client, called Places for Project Teams, can be used to set up a virtual workspace where teams can organize discussion databases and related documents, as well as communicate with instant E-mail, officials said.

even to other applications or server processes.

Graphical tools such as EasyAuthor are essential to exploiting the Web's capabilities, said Ezra Gottheil, senior analyst at Hurwitz Group, Inc., a Newton, Mass., research company. "It puts into the hands of the people who understand the content the needed tools with which to structure the user's experience [with the content]," he said.

Krakatoa lets users organize the information so it can be quickly searched.

"If you have the kind of information that lends itself to being organized in a hierarchy of this type, then I don't know a better tool for searching it," Gottheil said.

Krakatoa 2.1 will begin beta-testing before April. Server software starts at \$1,500. The server software runs on various Unix platforms and Windows NT, while the client software works with most popular operating systems and Web browsers.

©Cadis: (303) 440-4363.

Places for Project Teams is in beta now and can be obtained via Taligent's Web site (www.taligent.com). The product, which is expected to ship in the second quarter, runs on Windows 95 and Windows NT 3.5.1 or higher. Lotus Notes 4.1 or higher is required.

Also at the show, Lotus Development Corp. said it plans to license Marimba, Inc.'s Castanet Internet channel technology for Domino.Broadcast, an add-on that provides Internet broadcast or push capabilities to Lotus' messaging and Web application server.

Lotus expects to have the Castanet technology integrated and shipping in the first half of this year, said Keith McCall, director of Lotus' Internet Applications Division. The company also expects to have push technology from BackWeb Technologies, Inc. integrated with Domino.Broadcast within the same time frame.

Kalin is a correspondent for the IDG News Service in Boston.



## SHARP LOGIC

## Secrets of good software design

**A**s a network designer or manager, you are concerned with the efficient transmission of your organization's information. Your abilities to design and

implement the physical and logical layers of the net determine, to a great extent, the character and cohesiveness of your organization's entire IT infrastructure.

That's big stuff, but once the network is in place it becomes obvious that it has little value until the applications management envisioned are taking advantage of the available bandwidth. Enter the application software layers. Welcome to the most torturous aspect of systems work.

Many smart people have spent thousands of hours trying to figure out why

well-designed and well-implemented network infrastructures are so often loaded with gobs of inefficient, ineffectual and downright erroneous application software. There's got to be a reason. So let's take a look at what is working.

Microsoft Corp. uses a "synch-and-stabilize" development approach, which divides a product development life cycle into three phases: planning, development and stabilization. Microsoft spends about one-third of the total schedule on stabilization — which, in the case of a product such as Office, may take as long as a year.

In other words, the company locks the feature set and code, and spends much longer than most firms on internal and beta testing, until the software reaches what Microsoft calls the "zero-bug" release.

Even top-flight software developers make so many mistakes, it takes almost as long to fix errors as it does to create the original product. The other side of the story is well explained by Watts Humphrey, a senior director at Carnegie Mellon University's Software Engineering Institute.

According to Humphrey, virtually anyone who touches a software product during development introduces defects. **Marc Myers** Microsoft solves the problem by testing and debugging until the code is clean. What would a more preventive approach involve? A good design that is detailed, well documented and followed to the letter, you might be thinking. Perhaps.

The problem with good designs is that they change. With many new applications, users don't know what they want until after they've started using them. Then the design has to change, and when the applications are finally implemented they engender new problems that are addressed with new designs. After awhile, organizations build up a legacy of applications that are in place just to balance others, not because they solve business problems.

The solution to the software engineering dilemma may be component engineering. Rather than trying to solve very large problems with large applications that become extinct almost as soon as they are released, use components that solve small problems well. The programmer then becomes a component engineer, designing the most practical and efficient ways to integrate these reusable products.

Still, software engineering will never be an exact science so long as it is combined with that entirely unpredictable element known as the end user.

*Myers is chief executive officer of Client/Server Connection, Ltd., a New York-based software development company. He can be reached via the Internet at [mmyers@cscl.com](mailto:mmyers@cscl.com).*



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## Groupware upstarts staking their future on 'Net technologies

*New breed of Web-enabled collaborative tools could take away business from Lotus, Microsoft, Novell and other large players.*

By Paul McNamara

Vendors have settled on three basic approaches to delivering standards-based groupware in the Internet/intranet age:

- Take an established proprietary powerhouse — oh, say, Lotus Notes — and methodically revise it for the 'Net.

- Begin with a brand-name browser — Netscape Navigator, for example — slap on a few groupware functions and... voila!

- Or simply start with a blank sheet of paper, apply technological/entrepreneurial imagination and head for the open expanses of the Web.

All three vehicles are driving in the same direction: toward that promised pot of gold that is Web-centric business and commerce.



Conoco's Lines says Web-based groupware from Open Text has helped his company keep better track of safety-related documents.

The established players — Lotus Development Corp., Microsoft Corp., Netscape Communications Corp. and Novell, Inc. — get the lion's share of press attention and most of the traditional groupware market revenues.

However, it's the upstarts comprising that third contingent — companies such as Radnet, Inc. in Cambridge, Mass.; Open Text Corp. in Waterloo, Ontario; Action Technologies, Inc. in Alameda, Calif.; and WebFlow Corp. in Santa Clara, Calif. — that have truly staked their

futures on what is now being called "groupweb."

The definition of Web-based groupware appears to be in the mind of the definer. Some of the newer vendors are trying to match the big boys function for function, while others are carving out a niche — workflow, calendar/scheduling or video-conferencing. Still others are offering development platforms.

### Common threads

But two threads link these companies: faith in the Web browser as a cross-platform, eventually all-purpose client; and a from-the-ground-up adherence to 'Net standards such as Simple Mail Transfer Protocol, Post Office Protocol 3, Internet Message Access Protocol and Lightweight Directory Access Protocol.

The vendors' products have customers intrigued, but they are not deploying Web-based applications without trepidations. Security concerns are ever-present when companies consider taking their businesses to the 'Net, although more IT managers are seeing that as a reasonable price to pay for the simplicity, flexibility and mobility of browser-based clients.

For example, the tax division of software vendor Intuit, Inc. in San Diego recently deployed Action Technologies' Web-enabled workflow product to improve communications among employees whose job it is to funnel 600 separate products out the door in the 2 1/2-month window before W-2 forms start flooding snail-mail boxes.

While Action is no start-up — the company has been around since the early 1980s — it recently reinvented itself as a maker of Web-enabled groupware. Its Metro Web-enabled workflow interface allows Intuit to customize, distribute and regularly update 22 mission-specific application templates without

worrying about what client is sitting on an end user's desktop, as was the case with the company's older E-mail and various home-grown workflow systems.

"Everybody is already running a browser, so you just throw a server out there with the appropriate things on it and say, 'Here's the URL, go for it,'" says Craig Johnston, a software quality assurance engineer at Action. "I am constantly tweaking this [workflow system], giving people more views of information, giving them new applications."

Johnston also likes the price of Action's software (\$45,000) vs. prices from bigger name players (as much as \$250,000).

### More than workflow

Companies looking for more than Web-based workflow might want to check out LiveLink Intranet Suite 7 from Open Text, says Mellanie Hills, president of Knowledgies, a Plano, Texas, consultancy.

"The thing that is unique about [Open Text], as opposed to most of the smaller [companies], is the fact that they have so many capabilities integrated into one package," Hills says. LiveLink incorporates document management, workflow, collaborative tools and a search system.

The IT department at a Conoco, Inc. facility in Ponca City, Okla., has latched on to LiveLink to help manage the massive chore of tracking the intricate safety measurements that are so critical to any refinery operation.

"The two things that we were looking for were Web-based/intranet-based [products], and a very good workflow module that was interactive and interwoven with the document version control," says John Lines, IT director for Conoco's Mid-Continent Business Unit. "We think we've found it," he adds, based on an initial test installation of about 100 users.

LiveLink Library, the suite's document management component, features an intranet-based check-in/check-out system that assigns access to browser users by individual, group, folder and document. "[This ensures] that

people are working on appropriate versions, within a single, searchable environment. If this thing works, it will be the vehicle for all document information delivery on the intranet throughout the company," Lines says.

Ease of installation, management and end-user training are what separates a product such as LiveLink from more traditional groupware products, according to those who make and use the software.

### Getting attention

Among the hottest of Web-based groupware companies, at least in the view of analysts, is Radnet, which last month announced its WebShare 2.0 groupware development system. WebShare 2.0 includes replication support for laptop use, client-side ActiveX and Java support, as well as security based on the Secure Sockets Layer 3.0 standard.

"The Big Three — Lotus, Netscape, Microsoft — when they pitch a solution to corporate buyers, they're really trying to own the infrastructure that goes across everybody in the company," says Reed Sturtevant, chief technology officer at Radnet. "We can survive by providing an applications development

establishment in 1995, WebFlow has been a notable innovator with its SamePage Suite of applications.

The suite is a set of server-side applications that allow browser users to assign and accept tasks over SMTP-based mail systems.



*"Corporations will have a mixed environment for a long time."*

Reed Sturtevant, chief technology officer, Radnet

"Their whole paradigm is different from anybody else's," Hills says. "They are basically doing discussions inside of a document and will even allow you to assign to-do lists and action items inside of that same document."

Bruce Smith, manager of electronic data and management systems at Lockheed Martin Corp. in Sunnyvale, Calif., says his shop is making good use of the action-item features of SamePage. "It has enormous flexibility," Smith says. "We can readily extract information at the appropriate levels in order to present reports."

While everyone recognizes the enormous potential Web-based groupware provides for corporations looking to extend their intranets and extranets, there are cultural obstacles to overcome in addition to issues of security.

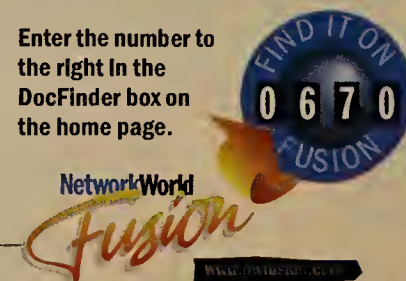
"The problem we're facing is that people don't want to interact on the Web," says David Marshak, an analyst at Patricia Seybold Group, Inc., a market research firm in Boston. "The Web is thought of as an interactive medium, but it's a very passive medium — people read, they don't respond, they don't write."

Which means they don't conduct an awful lot of useful business and commerce on the Web. To which the groupware vendors, in particular, have a two-word retort: Just wait. ■

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framework for the more structured business-process collaborative applications that work with anybody's back-end infrastructure."

Identifying a niche, of course, means little if you are unable to produce the goods needed to exploit that opening. Since its



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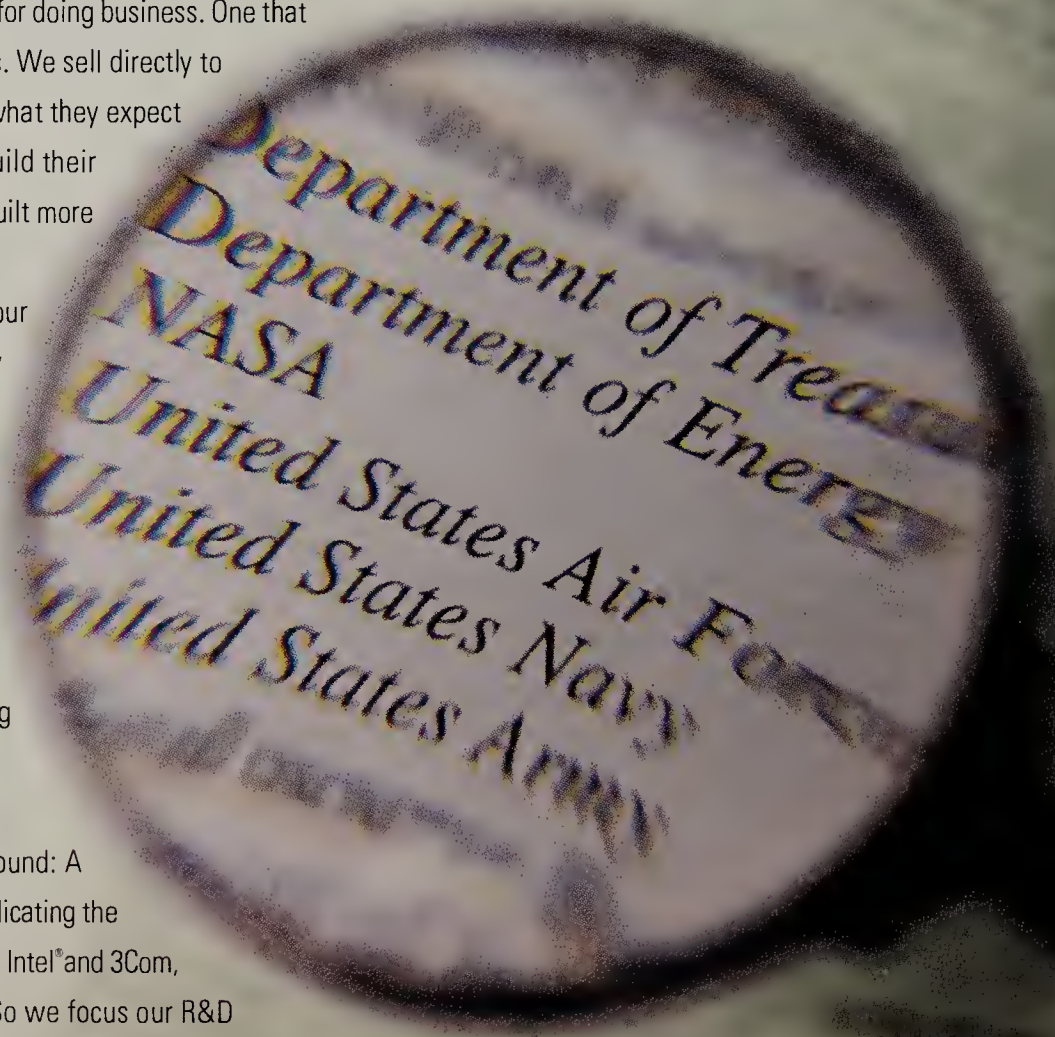
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- 256KB Pipeline Burst Cache
- PCI Local Bus Video with 2MB Video Memory
- 17LS Monitor (15.7" v.i.s., .26NI)
- Integrated 3Com 10/100 PCI EtherLink
- Integrated Sound Blaster Pro Compatible Audio
- 8X EIDE CD-ROM Drive
- Factory Installed MS Office Pro
- Factory Installed MS Windows 95 (30 Days Free Support)
- 3 Year Limited Warranty

★ *Upgrade to 64MB EDO RAM for just \$281.*

## \$2599

Product Code: #300434

#### DELL OPTIPLEX GXpro 180

180MHz PENTIUM PRO PROCESSOR

- *NEW* Tool-less Convertible Chassis
- 32MB EDO ECC DIMM/3GB EIDE Hard Drive
- 256KB Internal L2 Cache
- PCI Local Bus Video with 2MB Video Memory
- 17LS Monitor (15.7" v.i.s., .26NI)
- Integrated 3Com PCI EtherLink III
- Integrated Sound Blaster Pro Compatible Audio
- 8X EIDE CD-ROM Drive
- Factory Installed MS Office Pro
- Factory Installed MS Windows NT 4.0 (30 Days Free Support)
- 3 Year Limited Warranty

★ *Upgrade to 64MB ECC EDO RAM for just \$374.*

## \$2629

Product Code: #300392

#### DELL OPTIPLEX GXpro 200

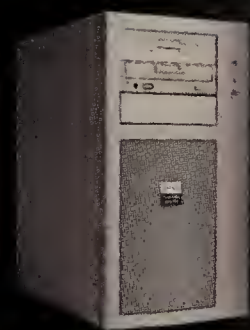
200MHz PENTIUM PRO PROCESSOR

- *NEW* Tool-less Convertible Chassis
- 64MB EDO ECC DIMM/3GB EIDE Hard Drive
- 256KB Internal L2 Cache
- PCI Local Bus Video with 2MB Video Memory
- 17T Monitor (15.7" v.i.s., .26NI)
- Integrated 3Com PCI EtherLink III
- Integrated Sound Blaster Pro Compatible Audio
- 8X EIDE CD-ROM Drive
- Factory Installed MS Office Pro
- Factory Installed MS Windows NT 4.0 (30 Days Free Support)
- 3 Year Limited Warranty

★ *Upgrade to a 20" Monitor (19.0" v.i.s., .26NI) for just \$794.*

## \$3199

Product Code: #300393 (Pictured System)



#### DELL POWEREDGE® 2100 SERVER

180MHz PENTIUM PRO PROCESSOR

- 256KB Integrated L2 Cache
- 32MB EDO ECC Memory (512MB Max.)
- Integrated PCI Ultra/Wide SCSI-3 Controller
- 2GB Fast/Wide SCSI-2 Hard Drive [12GB Max. (3 x 4GB)]
- 8X SCSI CD-ROM Drive
- 3Com 10/100 PCI Ethernet Adapter
- Intel LANDesk™ Server Manager v2.5x
- 3 Year Warranty\* including 1 Year Next-Business-Day On-site<sup>Δ</sup> Service
- 7 x 24 Dedicated Server Hardware Tech Support

★ *Add MS Windows NT® Server for just \$799.*

★ *Add a 15TX Monitor (13.7" v.i.s., .26NI) for just \$399.*

## \$2999

Product Code: #200143 (Pictured System)

#### DELL POWEREDGE 4100 SERVER

180MHz PENTIUM PRO PROCESSOR

(Expandable to Dual Processors)

- 256KB Integrated L2 Cache
- 64MB EDO ECC Memory (1GB Max.)
- Integrated SCSI-3 Controllers
- 4GB Fast/Wide SCSI-2 Hard Drive (24GB Max. via 6 x 4GB Hot Swap Drives)
- 8X SCSI CD-ROM Drive
- Intel Pro 100 PCI Ethernet Adapter
- Server Management System
- 3 Year Warranty including 1 Year Next-Business-Day On-site Service
- 1 Year DirectLine™ NOS Support
- 7 x 24 Dedicated Server Hardware Tech Support

★ *Add a Redundant Hot-Swappable Power Supply for just \$470.*

★ *Upgrade to a 200MHz Pentium Pro Processor with 512KB L2 Cache for just \$750 more.*

## \$5499

Product Code: #200158

#### DELL LATITUDE® LM P133ST

133MHz PENTIUM PROCESSOR

- 12.1" Active Matrix SVGA Color Display
- Modular 6X CD-ROM
- 16MB RAM/1.3GB User-Upgradeable HDD
- PCI Bus Architecture
- Smart Lithium Ion Battery
- 128-bit PCI Graphics Accelerator
- Integrated 16-bit Audio
- Built-in Stereo Speakers and Microphone Jacks
- Factory Installed Windows 95
- Touchpad with Palm Rest
- 3 Year Limited Warranty

★ *Add MS Office, a Nylon Carrying Case and a 33.6KB Modem for just \$449.*

## \$3099

Product Code: #300473 (Pictured System)

#### DELL LATITUDE XPi P133ST

133MHz PENTIUM PROCESSOR

- 11.3" SVGA TFT Color Display
- 16MB RAM/810MB Removable HDD
- PCI Bus Architecture with 256KB L2 Cache
- Smart Lithium Ion Battery with Advanced Power Management
- 128-bit PCI Graphics Accelerator
- Infrared Port for Wireless Connectivity
- Integrated 16-bit Audio
- New Optical Trackball
- Local DMI Compliant
- 3 Year Limited Warranty

## \$2759

Product Code: #600512

**DELL®**  
**800-846-9233**  
<http://www.dell.com/federal/>

GSA Contract #GS-35F-4076D

Keycode #19090

Prices listed are GSA Promotional Pricing only.  
Some mods still pending on GSA.

\*MMX Processor mod still pending GSA approval. †For a complete copy of our limited warranties, please write Dell USA L.P., One Dell Way, Round Rock, TX 78682. For more information call Dell's TechFax™ line at 1-800-950-1329. Prices and specifications valid in the U.S. only and subject to change without notice. <sup>Δ</sup>On-site service provided by third party service providers designated by Dell Computer Corp. MS, Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. Intel, the Intel Inside Pentium Pro logo and Pentium are registered trademarks and LANDesk and MMX are trademarks of Intel Corporation. 3Com and EtherLink are registered trademarks of 3Com Corporation. Triniton is a registered trademark of Sony Corporation. DirectLine is a service mark of Dell Computer Corp. ©1997 Dell Computer Corporation. All rights reserved.





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Our test center director is a member of the BAPCO board of directors.



## COVER STORY

### 18 *Great Graphics: The Best Color Printers You Can Buy*

As more government users add color to their presentations and reports, workgroup color printers are no longer optional peripherals but mandatory productivity tools. Our test center reviewed six color laser printers and three less-expensive alternatives to laser technology. After analyzing the speed, output quality and features of the printers, we recommend two systems: a laser and a solid-ink.

## COMMUNICATIONS

### 10 *Internet Security: Seven Firewalls That Keep Your Network Safe*

Firewall software is the best way to keep your data and your network safe from potentially harmful traffic coming in over the Internet. We reviewed seven of the best-selling firewall systems in the government market, including turnkey and open solutions for Unix and Windows NT platforms. All the systems are secure. Which one you should buy depends on the features you need.

## DEPARTMENTS

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Panasonic's CF-62 Notebook  
Roaster Technologies' Roaster 2.3  
BayStor's TwinStor

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25 Request for Comments

## COMING MARCH 1997

### Network Servers

Government Best Buys proudly unveils the government market's first-ever benchmarked review of network servers. We'll use our 40-node test network to test the mettle of dual-processor Pentium Pro servers from the top government vendors. We'll also evaluate design, features and pricing to choose the system that offers the best value.





## FROM THE EDITOR

By now, most of you are familiar with the *Government Best Buys* seal of approval: the black circle with a gold star inside and a blue ribbon floating off to the right. But some of you may wonder how we award this seal and what it means to you.

The seal is awarded to the winners of our product comparisons. In these comparisons, we use a best value-oriented approach to evaluate all kinds of products. We select the best-selling products in the federal market, and we ask vendors to provide us with the same configurations to ensure we conduct an "apples-to-apples" comparison. We then benchmark the performance of the products and analyze the setup, ease of use and



features. We also consider the quality of the documentation and service the vendor provides as well as the government price. We give each product a score for each of these categories, and then we calculate an overall score, from 1 to 10, that represents the value the product offers to government

buyers. The product with the highest score is awarded our seal of approval.

When you see the seal on a product, you can be assured that the product was put through our rigorous testing and came out on top. Vendors can place the seal on their product materials, packaging, advertisements and trade show booths.

Last year we awarded our seal to 29 products ranging from desktop and notebook computers to network operating systems and hubs. If you'd like to see which vendors won those comparisons, log onto our Web site at [www.fcw.com/pubs/gbb](http://www.fcw.com/pubs/gbb), where you can browse a list of winners and read the complete text of our reviews.

Although we're quite proud of

our *Government Best Buys* seal and what it stands for, it's not always enough. We can only award it to a product that wins one of our comparisons.

Sometimes we run into a terrific, one-of-a-kind product that surpasses our expectations. And so, we're introducing a new award — the Technical Excellence Award — to recognize innovative products that have captured the interest of our test center staff.

In this issue, we award our first Technical Excellence seal to the Phaser 350 printer from Tektronix (see Notes From the Test Center, Page 22). This special, solid-ink printer offers the speed

and output quality of a laser printer at less than half the price. Although it's not quite as good at printing photos as a laser printer,

the Phaser 350 is an ideal network printer for business graphics. We think it's a better deal than a color laser printer for most government sites.

Look for us to give our Technical Excellence Award seal of approval to other outstanding products that we review. And if you see that seal on a product, know that it is backed by the same rigorous testing as our *Government Best Buys* seal.

Carolyn Duffy Marsan



## LETTERS TO THE EDITOR

### Revisiting Parts for Java

I am writing to express both gratitude and frustration with *Federal Computer Week* on behalf of my company, ParcPlace-Digitalk. We are extremely pleased with the fact that FCW chose to review Java development tools as part of the Oct. 7 supplement. Our frustration is based on the thoroughness of that review by Lisa Stapleton and L.L. Hart. Our problem, however, is not so much with the scoring as with the fact that it seems as though the reviewers did not understand the product. Parts for Java differs from the other development kits reviewed in that it is a completely visual development tool. Time and again throughout their evaluation, the reviewers kept trying to use the product as though they were directly coding in Java — as you have to do with the other toolkits — but which doesn't make any sense with Parts.

Visual development with Parts is a simple process: The user drags a Java component off the palette, drops it onto the workbench and then saves the file. Linking the components is equally easy: You simply draw a link between two components on the workbench, and Parts writes all the event handling code for you, which is significantly easier than the VJ++ or Café approach of having to hand-code the event handling.

We are also concerned by their confusion over "which window, buffer or state" they were in. There are two windows and no buffers or states. The reviewers also mention importing code by cutting and pasting text from the files and note that this is "not a good method" — which is why Parts doesn't work that way. Parts handles any Java classes or files; you simply point your source path at them using the settings tool. There is no "importing" of files, unless you are again trying to hand-code as you have to do with the other tools.

It also appears that the reviewers were attributing Java Development Kit difficulties to the Parts product, which again doesn't make any sense. Parts for Java 1.0 does not install the JDK. The documentation clearly states this and tells the user exactly what to do if they need to install it separately. Parts also does not include a debugger but relies instead on the debugger in the JDK. ParcPlace is currently designing its own debugger, which will ship with the next major revision of the product.

We are left with the unfortunate conclusion that the reviewers assumed they knew how to use the tool because it

would be just like others on the market. Parts for Java, however, is different. It is designed to allow new Java developers to quickly become familiar with the language through visual development and to allow experienced Java developers to rapidly churn out applications.

One final note in closing: We apologize to Stapleton and Hart — and any of the other 20,000-plus Parts customers that purchased the product in its first three months of availability — for any difficulties experienced in installing the product. As they note, we had problems with a small percentage of CD-ROM drives due to a manufacturing glitch by our subcontractor, a problem which was quickly recognized and corrected.

Again, thank you for recognizing the importance of the Java tools market and for including Parts for Java in your review. We congratulate you on your efforts to focus on ease of use and hope that next time your reviewers will take the time to recognize that the purpose of a visual tool is to eliminate the need to continually hand-code the language.

Thomas Murphy  
Product Manager

ObjectShare, a division of ParcPlace

### Lisa Stapleton and L.L. Hart reply:

We want to assure Mr. Murphy that not only did we test his company's product thoroughly but, as is often the case when products run into problems in testing, we actually spent more time with Parts for Java than we did with any of the other products.

We did realize that this product was different; that was apparent from the beginning. We were actually excited about the product and included it in this comparison because we thought that it had the potential to beat the daylights out of more traditional approaches.

Be assured that we didn't hold the problem with the badly manufactured CD-ROM against Parts in the scoring because the second CD-ROM didn't have any problems and was delivered promptly.

The fact that important files and directories weren't installed correctly and paths updated in the correct places was, however, a scoring issue. We followed the directions that came with the CD-ROM to the letter when we installed the

product, but the process still went awry. Worse, we didn't discover that there was a problem until we tried to use the product.

We had to look in some of the configuration files, where some lines clearly referred to your product's path names and directories and some referred to those of other Java development products, such as Symantec Corp.'s Café.

When we explained this to your technical support representative, he told us that your product wasn't designed to work on the same computer where other development tools — such as Café — were installed. This is a serious flaw; users should be able to use a variety of tools that coexist with one another. (None of the other products had this problem.)

We edited the configuration files as instructed and reinstalled the JDK, which fixed the problem. Still, it would have been unfair to award the same score to Parts as we did to the other development environments when the other products did not have this problem.

Even after reading the documentation, it was difficult to understand how to use code created outside of the product or how to supplement the visual elements with other methods and classes. This is a crucial task for many users, some of whom already have code that they wish to use to create new applications. Also, anything that isn't easy to represent visually may have to be created, debugged and tested elsewhere.

We followed the directions in the on-line documentation for adding code, but it didn't work. A tech support representative instructed us to create a simple (throwaway) visual element and then cut and paste our test code into the application, which we did. Even this didn't work as it should have and overflowed the buffer that contained the source code. The technician said this was the only way that he knew of to include new code. Check your support log for Bug Report 4483 for more details.

We understood that the ParcPlace debugger provided is, in essence, the JDK debugger. For that alone, it deserves to be docked points; other companies have worked hard to make their debuggers more robust and easier to use than the original JDK.

Despite our low score for Parts, we think its heavy emphasis on graphical user interface development is essentially the correct approach. Unfortunately, this version didn't prove well-thought-out or well-executed.



## Remote-Access Router

Agencies looking for a product to connect offices at the outer edge of a network now can buy ROUTERmate Plus, a remote-access router from Osicom Technologies subsidiary Cray Communications, based in Annapolis Junction, Md. ROUTERmate Plus combines routing and wide-area network interface functions on one platform.

The product's 10Base-T local-area network interface supports IP, IPX routing and spoofing, and bridging of other protocols. Its WAN interface provides 56K Digital Data System, T-1 and fractional T-1 services. The data encryption standard and an integral management modem are options.

Because it integrates routing and WAN functions into one unit, separate products, cables and power sources are not needed, said James True, marketing director at Osicom.

"There's one connection to the LAN and another to the WAN. It's simple to install," he said. The router can be installed

and configured via a menu-driven user interface, and it automatically configures the network interface when connected to a T-1 line, Osicom said. It can also be managed with a single IP address, and its integral v.32bis modem allows management from any location, even if the network is down.

"We're addressing the cost of equipment, overall network ownership and simplicity" with ROUTERmate Plus, True said. The T-1 version retails for \$1,495, and the 56K version retails for \$995.

ROUTERmate Plus will be available on the General Services Administration schedule through resellers and will be added to contracts, including PC LAN+; Integration for Command, Control, Communications, Computers and Intelligence; Small Multiuser Computer II; Unified Local-Area Network Architecture II; Outside Cable Rehabilitation II; and the National Institutes of Health's Electronic Computer Store. For more information, call Osicom at (800) 359-7710.

— Colleen O'Hara

## IMPAC Pricing

Targeting the government credit card buyer, Dell Computer Corp., Austin, Texas, has revised the pricing for three desktop units for federal customers. During this promotion, Dell offers three OptiPlex desktop configurations with prices that come under the \$2,500 cap for International Merchant Purchasing Authorization Card purchases.

The lineup includes the OptiPlex GXpro 6180, a 180 MHz Pentium Pro desktop running Windows NT 4.0, which costs \$2,349. This minimum configuration includes 32M of ECC RAM, a 2G hard drive, a 15-inch Trinitron monitor, five PCI slots, an 8X CD-ROM, a Sound Blaster-compatible audio card, 2M of video memory, integrated Ethernet networking and Microsoft Corp.'s Office Pro for Windows NT. The GXpro can be converted from a desktop to a mini-tower chassis with-

### STATE AND LOCAL

## Calif. Stores Add Wall Data Products

The California Department of General Services' Information Technology and Education Center (ITEC) signed a master site license agreement with Wall Data Inc. to supply products through the California State Computer Store. Wall Data, based in Kirkland, Wash., will offer connectivity software including Rumba and Arpeggio, which provide database access, data transfer, report generation and information publishing via corporate networks, intranets or the Internet.

Sue Whitcomb, Wall Data's public relations manager, said these products are useful for organizations that need to access data stored on legacy systems from the desktop — a situation common in government agencies. Rumba is a connectivity product that allows PC users to connect to an IBM mainframe, AS/400, Unix or other host system and view the database information in a graphical format on the desktop. Arpeggio allows the user to publish queries and reports using information based on a host system. The product will work with any ODBC-enabled database and lets users view line dynamic reports.

The California State Computer Store is operated by AmeriData and CompuCom in partnership with ITEC and is open to all state agencies, counties, cities, local municipalities and school districts. The store offers more than 14,000 products and a variety of information technology services, including computer training, repair and upgrade services, and telecommunications consultants. All the products and vendors associated with the store go through a competitive bid process, resulting in pre-approved products and discounted prices for state and local agencies.

AmeriData and CompuCom operate three stores that act as showrooms. The stores are located in Sacramento, Los Angeles and the San Francisco Bay area.

For more information on the computer store and other ITEC services, such as Internet providers and Year 2000 service agreements, call (916) 324-MALL or visit their Web site at [www.dgs.ca.gov/itec/index.htm](http://www.dgs.ca.gov/itec/index.htm).

— Dustee Anderson

out tools, according to Dell.

For \$2,199, Dell offers the OptiPlex GXiM, which is based on the 166 MHz Pentium processor and which runs Windows 95. The configuration is similar to the GXpro, but it comes with EDO, not ECC, RAM, and it does not include a CD-ROM drive.

For \$1,999, users can buy the OptiPlex Gs+M, based on the 133 MHz Pentium chip and running Windows 95. This model does include the 8X CD-ROM but comes with only 1M of video memory. Gs+M users also have the option of upgrading to a 17-inch monitor for \$350 more.

All OptiPlex desktops are pre-configured for Energy Star compliance. For more information, contact Dell at (800) 694-3355.

— John Stein Monroe

## Internet Traffic Monitor

Government agencies are increasingly being asked to quantify the costs and benefits of Internet use.

In response, La Jolla, Calif.-based Bien Logic is offering an Internet traffic monitoring and reporting program that maintains a count of how many people visit a Web site, finds where users are located and determines how often they visit a site.

SurfReport 2.1 continuously reports this information in easy-to-read graphics and charts. Company officials, who are trying to break into the federal market after meeting with success in the state and local government markets, said SurfReport may deflect concerns from taxpayers and oversight agencies pertaining to the cost of a Web site by showing how often the site is used.

The product, which separates page hits from total hits, can process up to 50M (about 500,000 hits) per minute on a typical Unix server and can accommodate large log files of 200M or more. Generated reports can be viewed immediately, either on the Web or via e-mail. E-mail results can be exported for easy integration into databases and spreadsheets.

SurfReport also tracks server performance, listing error codes such as "file not found" and total number of errors for the time period. The product can be installed on most Unix Web servers: HP-UX, Solaris, IRIX, IBM/AIX and Linux. SurfReport costs \$99 to \$495, depending on the number of domains. For more information, call (619) 551-4888.

— Heather Harreld

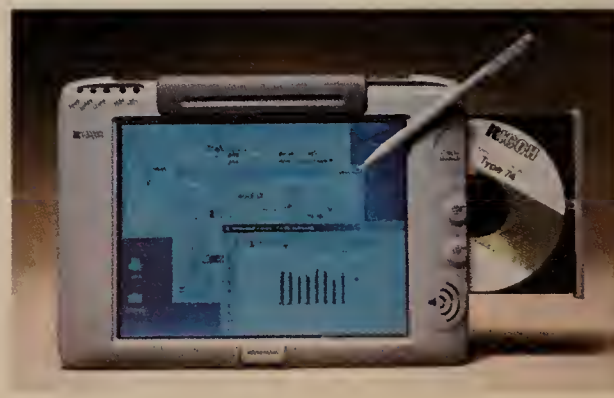
## New Pen-Based Tablet PC

Ricoh Corp., West Caldwell, N.J., is targeting federal customers with a pen-based tablet PC, which the company says is the first to include a CD-ROM drive.

Ricoh's G-1200S, which made its debut at Fall Comdex, is a pen-based multimedia computer that weighs 4.4 pounds. The product is powered by a 50 MHz 486DX2 chip and comes with 8M of RAM, upgradable to 24M. The G-1200S runs "full Windows" as opposed to Microsoft's Windows CE, an operating system designed for handheld computers, said John Biancamano, manager of systems products marketing at Ricoh's Digital Systems Group. The product ships with Microsoft's Windows 3.1 and is capable of running Windows 95.

Other product features include one Type II and one Type III PC Card slot with a removable 340M hard drive. The unit uses a lithium-ion battery that lasts up to four hours (or up to 2.5 hours under continuous CD-ROM use).

Ricoh plans to offer the product through the GSA





If you're going to buy a multimedia notebook computer, here's the minimum configuration we recommend:

SCREEN

11.3" active-matrix color

SOUND CARD

Built-in or PC Card  
16-bit sound card support

MODEM

28.8 kilobit/sec PC Card

VIDEO

1M to 2M of VRAM

CPU

133 MHz Pentium

MEMORY

32M of RAM

HARD DRIVE

1.6G

CD-ROM

Quad-speed

\*Windows 95 operating system

ACCESSORIES: Sturdy carrying case

schedule. The company is in discussions with federal resellers and plans to ink agreements with two or three companies, Biancamano said. Equipped with a CD-ROM drive, the G-1200S would make sense for agencies that need to deploy CD-ROM-based training manuals in the field, he said.

The product has a retail price of \$3,995, and Biancamano said the GSA price will be lower. For more information, visit Ricoh's World Wide Web site at [www.ricoh.com](http://www.ricoh.com).

— John Moore

## Mobile Computing for Macs

Macintosh road warriors now have access to the same high-speed cellular access available to their IBM-compatible PC counterparts.

Mariner, a PC Card from Motorola's Mobile Computing Products Division, Schaumburg, Ill., offers 33.6 kilobit/sec performance for modems, faxes or LANs through land lines or cellular connections. The product was introduced on the IBM PC platform in September.

For cellular users, Mariner was developed to integrate seamlessly with Motorola phones. It includes such features as auto-dialing, auto-answering and the Enhanced Throughput Cellular error-protection protocol.

For wired users, Mariner can be used with 10Base-T and 10Base2 Ethernet networks and supports the AppleTalk for MacOS communications protocol, Motorola said.

Mariner includes the Netscape Communications Corp. Navigator Web browser with service from Earthlink Inc. or special-priced service from CompuServe and America Online. A dual RJ-11 connector allows the computer and a telephone to share one telephone line and auto-detect LAN cable. Apple Computer Inc. has certified Mariner for use with its 5300, 190 and the new 1400 Series of PowerBook computers, according to Motorola.

Mariner has a suggested retail price of \$399 but will be offered on the company's GSA schedule, a spokeswoman said. For more information, call Motorola at (800) 4A-PCMCIA.

— John Stein Monroe

## Document Management Upgrade

Information Dimensions Inc., Dublin, Ohio, has released Version 8 of its BASIS document management product. The upgrade offers new tools for faster searches of document repositories and content-based retrieval of information.

BASIS V8, like previous editions, is designed for large-scale document management applications in secure environments. The new version will enable users to deploy the application on Windows NT.

Bruce Duff, vice president of corporate marketing with the company, said the new version will help customers provide access to documents in their legacy systems to a wider range of users.

The package is available through Information

### BEST-SELLING SOFTWARE

Dec.	Nov.	Product	Company
1	16	Notes	Lotus
2	1	Exchange 4.0	Microsoft
3	7	FormFlow v2.0	Symantec
4	2	System Management Server	Microsoft
5	12	Navigator v2.0	Netscape
6	5	Office	Microsoft
7	10	SQL Server v6.5	Microsoft
8	—	Norton Your Eyes Only v1.0	Symantec
9	8	Windows 95	Microsoft
10	—	Norton Administrator for Networks	Symantec
11	—	Windows for Workgroups v3.11	Microsoft
12	—	Norton Utilities v8.0	Symantec
13	4	Windows NT Server	Microsoft
14	—	WinFax Pro v4.0	Symantec
15	3	Windows NT Workstation v3.51	Microsoft
16	—	Access	Microsoft
17	—	Backup Exec for Netware	Seagate
18	15	Project v4.1	Microsoft
19	—	Norton AntiVirus v2.0	Symantec
20	—	Freelance 96	Lotus

This list ranks the top 20 software products according to the total number of units sold in December 1996 on the General Services Administration's multiple-award schedule B/C, as compiled by Government Technology Services Inc., the largest GSA reseller.

Dimensions' GSA multiple-award schedule contract as well as through several integrators. Federal customers include the Energy Department, the Defense Department, the Secret Service and the House of Representatives.

BASIS V8 is free to customers who are part of Information Dimensions' maintenance program. Commercial pricing for a new installation begins at \$22,000. For more information, call the company at (614) 761-7290 or point your Web browser to [www.idi.oclc.org](http://www.idi.oclc.org).

— Elana Varon

## Wearable Electronic ID

Although it has not yet made its appearance on the Paris fashion runways, the newest accessory in 1997 may be wearable digital computer chips that can be used for electronic commerce.

Available in the first quarter, Dallas Semiconductor Corp., Dallas, plans to ship its 16mm automatic identification tool called the Cryptographic iButton. Not much larger than a button, the iButton positively authenticates a person to a server or to another person using a personal identification number. It can be attached to a wallet, key chain, jewelry or employee badge.

With the iButton, users will have universal access to their Web e-mail at public Internet connections, including hotels, airports and kiosks, and still be confident that their e-mail is private. Sensitive information, such as credit card numbers (for electronic purchases), can be transmitted safely using the button. Mobile employees can obtain secure access to agency databases while traveling.

The company is negotiating a contract with the U.S. Postal Service for the sale of the iButton. USPS already has notified its postal meter customers that it will replace its current postage meters using a Postal Security Device connected to a PC. Using the iButton as a PSD, USPS will be able to refill its postage meters over the Internet, according to Dallas Semiconductor officials.

In the event that software or PC hardware is hacked, information remains safe in the physically secure iButton chip. In one model, the chip generates a public- and private-key set. The private key is known only to the iButton. If someone tampers with the chip, it will erase the private key.

The price of the product has not yet been determined, according to the company's marketing communications manager, Syd Coppersmith. Eventually, she said, the company hopes to offer the product for a \$12 annual fee. Users will also be charged an initialization fee by individual service providers. For more information, call (972) 371-4448 or check out the company's Web site at [www.iButton.com](http://www.iButton.com).

— Heather Harreld





## Panasonic's CF-62

### Powerful Notebook Packs Multimedia Features

BY DAN CARNEY

Consumer electronics stalwart Panasonic Personal Computer Co. has created a multimedia notebook that boasts impressive engineering but misses on some simple ease-of-use issues.

The machine packs a Who's Who list of emerging technologies: high-performance CardBus PCI 32-bit PC Card slots; a zoomed video port for high-speed video; a 12.1-inch, thin-film transistor, active-matrix, 1,024-by-768 color display; a 64-bit Chips and Technologies video display adapter; an infrared communications port; built-in speakers and microphone; and a combined quad-speed CD-ROM and optical recording drive based on Panasonic's PD technology.

The PD drive uses a proprietary cartridge storage medium that is about the size of an old-fashioned 5.25-inch floppy disk but is thicker and rigid. Its 650M stor-



#### SYSMARK/32 Speed Scores

Desktop Graphics	146
Spreadsheet	114
Desktop Presentation	84
Desktop Publishing	76
Word Processing	76
Database	72
Overall	89

age capacity and easy removability make it ideal for government applications that require sensitive information be secured at night. The drive has seek time and data transfer rates that are better than a CD-ROM but worse than a hard disk drive. I found it fast enough to run applications, which is not true of the other popular removable storage technology: Iomega Corp.'s ZIP drive.

The CD-ROM/PD drive lies under the keyboard and can be accessed by sliding a lever that sits between the keyboard and the GlidePoint touchpad. With the whirring of servo motors, the keyboard pops open, and the drive rises and slides forward.

However, all those moving parts have two obvious drawbacks: added weight and reliability. The CF-62 weighs nearly 10 pounds, and the loading device for the PD drive sure looks wobbly and fragile.

Panasonic blames part of the CF-62's bulk on its rugged case, which may appeal to military users. The notebook doesn't have a full metal jacket but does have a magnesium cover to shield the display from behind.

Although the technology is exciting, Panasonic missed some of the basic ease-of-use issues. For example, the notebook has no quick-start guide and only the most rudimentary user's guide. Additionally, it takes nearly a half hour to set up the notebook, instead of having it run right out of the box.

The documentation explains that drive D: is the PD drive and that drive L: is the CD-ROM, but there is no explanation for the E: and F: drive icons that don't do anything. An eager buyer will find that the PD drive doesn't work immediately because the included PD cartridge is not formatted. Once that task is done, the CF-62 is ready to run.

Panasonic uses an LCD above the keyboard to show the notebook's functions and its remaining battery life. The GlidePoint touchpad pointing device is almost good enough to win me away from my preferred trackballs. The speakers are tinny-sounding. The 12.1-inch display is gigantic for a notebook, and the 1,024-by-768 resolution is excellent.

I tested a 133 MHz Pentium-based model with 16M

#### REPORT CARD

##### CF-62 Multimedia Notebook

Panasonic Personal Computer Co.  
(800) 662-3537  
[www.panasonic.com](http://www.panasonic.com)

##### Price and Availability

\$5,111 on GTSI's GSA schedule.

##### Remarks

The Panasonic boasts a dazzling array of innovative technologies. The price is high but reasonable considering the PD drive and 1,024-by-768 display. The downside is the huge size, hefty weight, weak documentation and unnecessary hassles in setting up the notebook for the first time.

##### Final Score

Very Good

of RAM and a 1.35G hard drive. It scored an 89 on the Business Applications Performance Corp.'s SYSMARK/32 benchmark for Microsoft Corp.'s Windows 95 and Windows NT — a little below other 133 MHz Pentium notebooks that *Government Best Buys* has tested.

The lithium-ion battery lasted 3:07:22 in the battery test suite. Its score of 135 on BAPCO's Battmark32 is better than most competing notebooks. I ran the test with the notebook set up for maximum battery conservation, which puts the hard drive, CD-ROM and display timeouts at one minute of idleness.

Government Technology Services Inc. sells the CF-62, outfitted as tested, for \$5,111 on the General Services Administration schedule. The CF-62 packs more functions and features than most notebooks. If Panasonic could smooth a few of the rough edges, the CF-62 would get an unqualified recommendation. ◀

Carney is a Federal Computer Week contributing writer.

## Roaster Techs' Roaster 2.3

### Java Development for Macs

BY LISA STAPLETON

Roaster 2.3 from Roaster Technologies (formerly the Java

division of Natural Intelligence Inc.) is a Java development environment that, unlike competitor Symantec Café for Apple Computer Inc.'s Macintosh, fully exploits the Macintosh environment as it should.

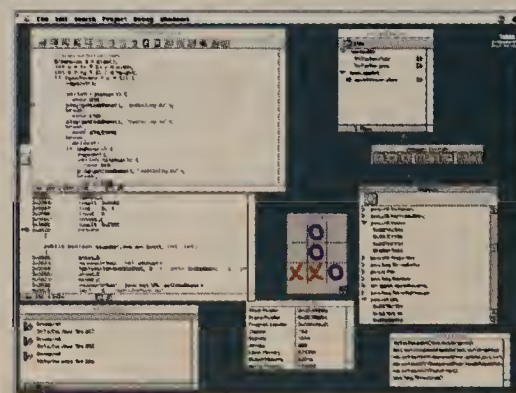
It's easy to use, fast and fairly bug-free. But it has a few annoying features that keep it from being truly great.

Perhaps one of Roaster's worst flaws is the time and trouble that it takes to download the update from the World Wide Web site and combine it with your old copy of Roaster. You have to move new files into different folders, run two installers, delete old files and reboot. (My system crashed the first time I restarted the computer.) There has to be an easier way.

But once installed, Roaster made it easy to create a project, import Java classes and create new code.

Unlike Café, which offered only one way to create a project and add files to it, Roaster is quick and flexible, letting you add all the Java files in a folder with a single operation. Also unlike Café, Roaster doesn't require you to read documentation before starting. Its menus are so well-designed that you can quickly find what you want.

The documentation is extremely well-organized and reference-oriented, which makes the product easy to use. The downside: Some of the descriptions of different



classes and methods seem to be missing.

We tested compilation speed on a Macintosh 7500 with 32M of physical memory and clocked it at 5,000 lines per minute. (Roaster lets you choose whether you wish to compile using JAVAC or Roaster's own compiler, but I was only able to compile successfully when I used the former.

Roaster Technologies says you'll be able to use the Roaster compiler in a later version.)

The debugger is fairly smart too; I only faked it out once with one of my exception-handling tests.

Pricing is a little steep; for a full subscription, which entitles you to two major updates, you'll pay \$199. For one-time purchases, government buyers get a \$30 discount off the normal \$129.

Overall, Roaster is a nice development environment for the Macintosh and compares favorably with its competition, although there is room for improvement in the areas of speed, installation and documentation. ◀

Stapleton is a writer and former programmer living in San Jose, Calif. She is also the founding editor of Netscape World and the author of *An Absolute Beginner's Guide to Unix*.

#### REPORT CARD

##### Roaster 2.3

Roaster Technologies  
(617) 876-4876  
[www.roaster.com](http://www.roaster.com)

##### Price and Availability

\$99 for government users only, direct from the company.

##### Remarks

Roaster offers good Java development features, but the installation is too complicated and takes too long. The documentation also needs improvement.

##### Final Score

Good



# BayStor's TwinStor

## Powerful But Tricky Personal RAID

BY LINDA ROHRBOUGH

What if you could easily add a card to your system that would allow you to connect a second hard disk drive and mirror the data on your hard disk drive in real time? And what if the card costs less than \$150, doesn't require memory-resident software, works transparently, allows you to use any hard disk drive that is the same size or larger than the one you have and works with DOS, Windows 3.x, Windows 95 and Windows NT?

Interested? I was even more intrigued by the claim that the card would automatically switch to the mirror drive without any interruption if the main drive fails. That's what BayStor Inc. is offering with the TwinStor IDE Personal RAID-1 controller.

The TwinStor is an 8-bit RAID (Redundant Array of Independent Disks) controller that piggybacks off the existing IDE controller to allow you to mirror up to two hard disk drives in a master/slave configuration. The controller uses the existing system BIOS and doesn't install software drivers into the boot sectors of the drives being mirrored. That means if you decide to remove the TwinStor, you can simply reconnect either the mirror drive or the primary drive back to your IDE controller and go on with your business.

There has to be a catch, you say. Of course there is. For me, the catch was that I happened to be the only TwinStor user with a sound card that produces a terminal error when the TwinStor is installed. Also, I went through five TwinStor cards (three beta versions and two production models) before I got one that worked.

You need a bootable floppy diskette to install the TwinStor. While the documentation is skimpy, a simple look at the card is all that's necessary to figure out how to install it. The card has three IDE connectors: one labeled "Host" and the other two labeled "Primary" and "Mirror" respectively.

The card comes with two IDE hard disk drive cables and a splitter for the power cable. While there are three connectors on the card, it's assumed that you already have a cable connecting your IDE controller to the hard

disk drive. The cable from the IDE controller is connected to the Host connector on the card. The existing hard disk drive is cabled to the Primary connection, and the mirror drive is cabled to the Mirror connection.

The drive you choose for the Mirror drive can be any IDE hard disk drive, but it has to be the same capacity or larger than the Primary drive. BayStor says the mirror drive need not be partitioned or formatted, but I ended up doing so.

I needed lots of patience and a sense of humor when dealing with BayStor's technical support. Eventually, I determined my problem was twofold: One was the multimedia hardware, and the other was getting the system to recognize the hard disk drive with the card installed.

I started my tests with the TwinStor on a 486-based system equipped with an IDE CD-ROM drive and a Creative Labs Inc. Model CT2940 16-bit Plug and Play sound card. In this configuration, the TwinStor caused the system to refuse to boot. In fact, the system wouldn't even get to the BIOS beep codes, there was no video display at all, and the keyboard Num Lock, Caps Lock and Scroll Lock lights would stick in the "on" mode.

After much hassle and testing, including moving the TwinStor and the multimedia hardware to another motherboard altogether, I was able to determine that the culprit was a conflict between the TwinStor and the sound card. If the sound card was removed and the CD-ROM drive was installed, the system booted without a problem.

Once I identified that the problem was the Creative Labs CT2940 sound card, BayStor assured me that they would work to find the source of the problem.

Finally, the fifth TwinStor card I received worked. I installed it on the 486 system running Windows for Workgroups 3.11 and DOS 6.22 as well as on a Pentium-based system running Windows 95. When installing the software under Windows, I installed it from the DOS prompt using the instructions in the documentation. I quickly discovered that the DOS TwinStor software did not install correctly. While it created a TWINSTOR directory on my hard disk drive and added to my AUTO-EXEC.BAT file a command to start the TwinStor utility, it had neglected to copy the files from the installation diskette to the new directory. I had to do it myself using the DOS Copy command.

There was one obscure reference in the documentation to using the command TWINSTOR /? to get a list of software switches for the DOS version that produce various functions, but the documentation did not have a listing of the switches or their meaning. For example, to set the drives up for mirroring, you must use the command TWINSTOR /R. This is the Rebuild command, and it is used initially to set up the drives for mirroring. This isn't clearly documented anywhere.

The Windows 95 TwinStor software is better than the TwinStor DOS version because the installation works, and the software offers menus you can look in for commands. This version offers the Rebuild command in the Command menu once the software is installed, but again, this is undocumented. BayStor assumes the user is familiar with RAID controllers and will know what to do. Little or no explanation of the software functions is offered in the printed documentation or in text files on the diskette.

Once the mirroring worked, I made obvious, visual changes, saved them and shut down the system. I then removed the power from the primary drive and restarted the system. The TwinStor worked like a champ in both DOS and Windows 95. I received an error message in the DOS environment that the primary drive was not operational, but under Windows 95, I had to start the TwinStor software before there was any indication of a problem.

You have the option of setting up an audible tone in case of a problem, but this feature is undocumented.

While I had the mirror drive running, I made more visible changes to the environment, shut down the system and reconnected the primary drive's power supply. I then started the TwinStor software. In DOS and in Windows 95, the TwinStor software informed me that the drives needed to be rebuilt. Thankfully, the TwinStor software was smart enough to use the mirror drive with the newest data to rebuild the Primary drive.

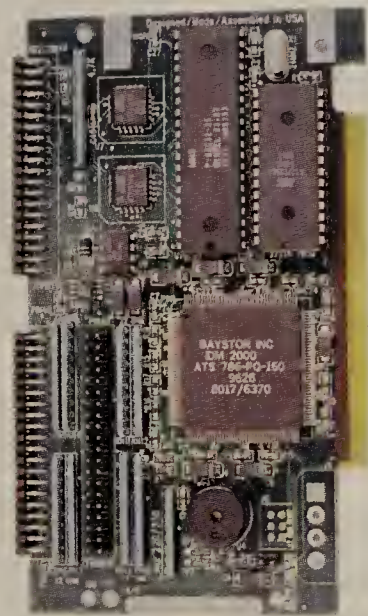
BayStor also sent me the Clamshell, which is the TwinStor card in a tough plastic case. The three IDE connectors are available through openings in the case, and there's a

Molex-type four-prong power connection that uses one of the power cables from the power supply. The Clamshell is designed to allow users who don't have an expansion slot in their system or who have external hard disk drive arrangements to be able to use the TwinStor. I tested the Clamshell with the Creative Labs sound card, and I had the same boot-lockup problem.

The TwinStor supports logical block addressing (LBA) mode, which is the most popular way of getting past the DOS-imposed 540M size limit for hard disk drives. This means that if the system will support a drive larger than 540M, then the TwinStor will as well. Some newer hard disk drives have LBA support built in, and these drives can be used with non-LBA hard disk drives as long as the mirror drive is larger than the existing drive. I used a Maxtor 1.6G hard disk drive with LBA mode built in to mirror a 540M Conner drive and later to mirror a 1.2G Conner drive. One thing to note, though, is that you lose the excess capacity of the mirror drive. For example, if I use the 1.6G drive to mirror a 540M drive, the system will see the 1.6G drive as 540M, even if the 540M drive is removed. The only way to get that capacity back is to repartition and reformat the 1.6G drive, which means the data on it will need to be backed up to another source, or else it will be lost.

Having an up-to-the-minute backup on two hard disk drives with either one ready to take over when the other fails is very attractive with more critical applications running on PCs. The fact that you can simply take an existing TwinStor mirrored drive and move it into another system with no fuss is even better. The price point is also attractive, but getting the TwinStor working requires technical experience on the part of whoever installs it because this is a product with quality-control problems that also assumes you know something about RAID controllers. ◀

Award-winning author Rohrbough received the "Best Nonfiction Computer Book" award for 1994. She is the author of *Upgrade Your Own PC* (IDG, 1996), *Start Your Own Computer Repair Business* (McGraw-Hill, 1995) and *Mailing List Services on Your Home-Based PC* (McGraw-Hill, 1994). You may contact her on the Internet at 75570.3235@compuserve.com.



### REPORT CARD

#### TwinStor IDE Personal RAID-1 Controller and TwinStor Clamshell

BayStor Inc.  
(408) 578-7760  
[www.baystor.com](http://www.baystor.com)

#### Price and Availability

TwinStor Controller and Clamshell pricing are the same: \$149 retail. No GSA availability to date.

#### Remarks

BayStor has quality control, documentation and technical support issues that require not only a sense of humor but also technical experience on the part of the person who installs the TwinStor IDE Personal RAID-1 controller. However, the TwinStor's transparency to the user, its simplicity, flexibility and low cost are bound to make it a success.

#### Final Score

Satisfactory



# Internet Security

## Seven Firewalls That Keep Your Network Safe

► BROOKS TALLEY

**You're under pressure to put more information on your Web site for citizens to browse. But you also need to keep your agency's sensitive data safe. What should you do? Buy a firewall system, the best solution available for securing Internet connections.**

**We reviewed seven of the best-selling firewall systems in the federal market. All of them provided excellent security in our network tests, but they offer different interfaces and features.**

**W**hen you put up a World Wide Web site, you need to ensure that the information available to the outside world is only what you want made available. In recent years, firewalls have sprung up to solve this problem.

Firewalls are, by nature, complicated devices. Because their role in network security is so crucial, even a small error in configuration can lead to disastrous consequences. For that reason, we're glad to see that today's firewalls have come a long way from their roots as cryptic, text file-based Unix applications.

The first generation of firewalls focused exclusively on security, generally using one of two methods: packet filtering or proxy services. Packet-filtering firewalls examine each packet that attempts to enter or leave the network and compare it with a programmed list of criteria. In typical configurations, packets are blocked unless they are specifically allowed.

Proxy-serving firewalls take a different approach. They act as intermediaries to network requests and require that each client be configured to use the proxy services or that each client specifically log onto the proxy server before making a network request. The client then asks the proxy server to talk to the outside network, and the proxy server responds with the remote system's answer. No packets are exchanged directly between a client system behind the proxy server and the outside network.

The basic functions of firewalls haven't changed, but the methods they use have improved dramatically. All the firewalls we looked at use proxies, packet filtering or both. But most are much more sophisticated than old-style firewalls and place a new emphasis on easy administration.

Transparent proxying is one of the most interesting new technologies and is found in CyberGuard Corp.'s CyberGuard Firewall 3.0, Milkyway Networks Corp.'s Black Hole 3.0 and V-ONE Corp.'s SmartWall 3.3.1. Rather than requiring each client station to be configured to use the firewall as a proxy server, these firewalls listen to network traffic and intercept packets intended for the outside world. They then echo the client's original request but make it appear that it came from the firewall. When the outside host

responds to the firewall, the process is reversed, and the firewall supplies the data to the client as if it had come straight from the outside network.

The advantage of this approach is twofold: When the firewall is installed, administrators aren't required to make configuration changes on each client system. And when new systems are introduced to the network, no unusual configuration needs to be done, which makes it easier for non-Internet Protocol-savvy staff to set up new systems.

One of the most frustrating aspects of administering earlier firewalls was the lack of remote administration capability. In order to make even minor configuration changes, an administrator had to be physically at the firewall. An administrator responsible for firewalls in a wide-area network found himself either shuffling among the locations or trusting network security to a less-experienced employee in a phone walk-through.

While remote administration of firewalls raises some security questions — How can you be sure you're the only one changing settings? — the technology for secure communications on public networks is readily available. Packages such as CheckPoint Software Technologies Ltd.'s CheckPoint Firewall-1 2.1 and Trusted Information Systems Inc.'s Gauntlet Internet Firewall provide secure remote administration.

Today's firewalls also offer a host of third-party authentication schemes that were nonexistent several years ago. From the one-time-only passwords of Secure/ID to the credit card-size number generators used for SecureCard, network security is limited only by one's budget and the degree of hassle one's users will bear.

What's more, modern firewalls increasingly are offering Virtual Private Network (VPN) integration, whereby the Internet can be used as a WAN. Traffic between firewalls is encrypted automatically and transmitted across the public network. When it reaches a branch office, the firewall verifies its origin, decrypts the traffic and puts it back on the local-area network.

VPN integration used to require that a network standardize on one vendor's firewall, but an emerging standard for intervendor VPN communication has been embraced by many vendors. VPN is offered by CheckPoint, Cyber-

Guard, Black Hole and V-ONE.

We looked at these firewalls as they would be used in a 150-user network. Because each vendor's licensing is different and most are tier-based but with different user levels for each tier, pricing considerations may vary widely among sites. Some vendors have unlimited user pricing starting at 250 users, while other solutions may continue to get more expensive well beyond the 1,000-user mark.

All the firewalls we tested provide excellent security. The differentiating factors are ease of administration and installation, flexibility and, of course, pricing and technical support.

The winner of our comparison was CyberGuard, which offered the best administration tools along with very good flexibility and installation. In second place was CheckPoint, which offered very good flexibility and remote administration capabilities.

### CyberGuard Firewall 3.0

CyberGuard's CyberGuard Firewall 3.0 is the most improved product in this comparison, and we were pleasantly surprised by our experi-

#### AT A GLANCE

### Firewalls

#### Pricing

Total systems, including hardware and software, range from \$9,000 to \$22,000.

#### What's Selling

Firewalls are the best-selling solution today for securing the connection between internal networks and the Internet.

#### Where to Find Bargains

Good pricing is available on agency contracts as well as the GSA schedule. However, pricing should not be a major factor in selecting a firewall. Performance and features are far more important.

#### What to Specify

If you need to remotely administer firewalls, be sure to specify that requirement. Another nice feature is transparent proxies that eliminate the need to install software on all your network clients. Also, consider whether you need a graphical user interface or whether a Unix-style system will do.





ence with it. Running on a standard Intel Corp. platform and supporting multiprocessor systems, CyberGuard has all the features and capabilities of its predecessors without the annoying quirks.

We especially liked the inclusion of a couple of boot floppies and a backup tape. In the event of a total server crash, it would be easy to get the firewall back up, if not configured ideally, in well under an hour.

We also liked CyberGuard's decision to port to an Intel-based Unix platform. In the past, CyberGuard touted its proprietary (not to mention weird) hardware as an additional security feature that would discourage tampering. However, if malicious parties have physical access to your firewall, you've got bigger problems to worry about.

During our test, CyberGuard's interface was thankfully free of the problems that plagued Version 2.0. CyberGuard Firewall 3.0 is truly an impressive product.

## Installation

Because CyberGuard's purchase price includes an on-site visit from one of their field technicians, it's hard to imagine an easier firewall installation. As long as you have some idea of the policies you want to implement, CyberGuard's representative can configure the firewall for you or help you configure it yourself, if you'd like the experience. If you don't have a clear idea of your policies, CyberGuard will recommend standard settings.

If you need to configure the system yourself — say, after a disaster — the process is very simple. It took us only about 15 minutes to completely rebuild our test server.

Because the software is geared specifically for the hardware, no machine-specific configuration options are available. While we would prefer an open architecture that would let us supply our own machine, getting a pre-configured firewall saves a great deal of setup time.

Even the advanced features, such as IP address translation, were implemented so elegantly that it took only one check to turn them on. Overall, CyberGuard gets a very good score for installation.

## Administration

CyberGuard's administration console is without a doubt the most elegant and easy to use of any of the products we tested. The graphics and user interface are

## THE CONTENDERS

- **CheckPoint Software Technologies Ltd.'s CheckPoint Firewall-1 2.1**, available on the General Services Administration schedule. **Score: 7.60**
- **CyberGuard Corp.'s CyberGuard Firewall 3.0**, available on the Integration for Command, Control, Communications, Computers and Intelligence contract and the GSA schedule. **Score: 7.80**
- **Milkyway Networks Corp.'s Black Hole 3.0**, available on the GSA schedule and the National Institutes of Health's Electronic Computer Store. **Score: 6.70**
- **Raptor Systems Inc.'s Eagle NT**, available on the GSA schedule. **Score: 6.50**
- **Secure Computing Corp.'s Sidewinder Security Server 3.0**, available on the PC LAN+ contract. **Score: 7.40**
- **Trusted Information Systems Inc.'s Gauntlet Internet Firewall**, available on the GSA schedule soon. **Score: 6.90**
- **V-ONE Corp.'s SmartWall 3.3.1**, available on the GSA schedule. **Score: 7.10**

very slick, and it seemed like every configuration option was in the first place we thought to look for it. Unlike with some previous versions, we uncovered no glitches in the interface.

CyberGuard arranges packet filtering rules in an easy-to-understand table, with rules being executed from the top down. Creating new rules was easy and intuitive.

Setting up sophisticated technologies such as IP address translation and IP spoofing detection was handled by a single check box and took effect immediately. Such smooth administration features no doubt will hasten IS managers' adoption of these powerful security technologies.

The only feature that CyberGuard lacked was remote administration. CyberGuard gets a very good score in administration.

## Flexibility

CyberGuard's support for proxies and packet filters makes it a very flexible solution, so it receives a very good score. IP address translation is another tool to allow administrators to configure a firewall for a particular environment.

Proxies exist for virtually every popular protocol, including RealAudio and several other User Datagram Protocols (UDP). A wide range of authentication methods also is available. Time- and date-based configuration are supported. CyberGuard earned a very good for flexibility.

## Security

We tested CyberGuard in its initial

configuration and found that it allowed no traffic through whatsoever. After configuring our network rules, we confirmed that only traffic that we expected to be let through was. CyberGuard gets an excellent score for security.

## Summary

CyberGuard offers a solid, turnkey firewall solution that is particularly easy to administer and comes bundled with installation services. We recommend it to any government site that doesn't need to manage remote firewalls. Its support for high-end multiprocessing Intel PCs also makes it a good candidate for an intranet firewall because it can support 10Base-T speeds and above.

## CheckPoint Firewall-1 2.1

Because of our testing cycle, we were unable to evaluate CheckPoint's 3.0 product, which just began shipping. CheckPoint 2.1, though, performed admirably for us. Its installation process still could use some work; it was the least friendly of the bunch. Overall, though, CheckPoint is a very solid product with a history of reliability and a refined user interface.

The addition of a remote administration tool that runs on Microsoft Corp.'s Windows 95 and can control Unix- and Windows NT-based CheckPoint firewalls is a great improvement.

## Installation

Installing CheckPoint will require

at least a bit of comfort with the Unix operating system it runs on. While that may be intimidating for administrators without Unix experience, CheckPoint has done everything it can to make it as easy as possible.

The installation itself is accomplished by a Unix script that leads the user through a series of questions about the product and the desired configuration. The script then makes any necessary modifications to the various Unix RC scripts; we didn't have to touch a single one to get the product up and running.

Unlike previous versions, 2.1 can disable the Unix kernel's internal IP routing automatically. This eliminates a potential security flaw during boot and if anything should happen to the rules database.

While the script-based installation is preferable to manual installation, it doesn't offer all the amenities that a graphical user interface (GUI)-based installation program could. For instance, there's no ability to go back once a mistake is made. CheckPoint gets a satisfactory score for installation.

## Administration

CheckPoint's administration GUI is very straightforward, and configuring new rules and policies is about as easy as can be. Its graphical representation of packet filtering rules is intuitive and easily understood, minimizing the chance of an inadvertent error in configuration.

What's more, CheckPoint's secure remote administration capabilities allow network administrators to examine the firewall's configuration or to make changes to it from the comfort of their desks. The remote administration tool communicates with the firewall via encrypted packets, so there's no danger of compromising the firewall's security during remote administration.

Packet-filtering rules are easy to create. CheckPoint comes with definitions for all sorts of traffic, from basic HTTP to RealAudio and even its own interfirewall protocols. We simply had to choose a source, destination, traffic type and action, and the firewall took care of the details.

Adding users and groups, and defining rules for them, was as easy as adding packet-filtering rules.

Our only complaint was that after each change, we had to tell the firewall to "recompile" the

security rules and implement them. It would be nice if this step could be taken automatically whenever rules are changed. Overall, CheckPoint gets a very good score for administration.

## Flexibility

CheckPoint's flexibility is comparable to CyberGuard's and likewise gets a very good score. It offers a host of proxies, including a bare-bones generic proxy, plus packet filtering to allow virtually any realistic configuration. UDP support is thorough as well. Authentication is performed using Secure/ID or several other methods.

Like CyberGuard, CheckPoint offers time- and date-based configuration, giving administrators that much more control of what traffic is allowed. It received a very good score for flexibility.

## Security

CheckPoint, too, passed our initial configuration and post-configuration tests, at first allowing no traffic and later allowing only the traffic we expected. Like the others in this comparison, it receives an excellent score for security.

## Summary

CheckPoint is a good solution for government sites that need remote administration capabilities. We'd like to see easier installation for this Unix-based offering, but once installed it proves easy to administer. We also liked CheckPoint's solid feel; there was never any doubt about the state of the firewall.

## Sidewinder Security Server 3.0

Secure Computing Corp.'s approach of providing Sidewinder pre-installed on a system left us a little bit uneasy. We'd rather spend the time doing the installation and getting familiar with the software and how it works. With a pre-installed system, administrators will likely know nothing about the underlying system until there's a problem, which is not the best time to learn.

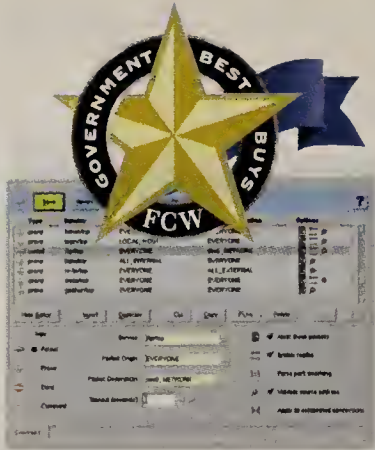
Still, using the system was an impressive experience, not unlike sitting at a pilot's seat. While it may be intimidating for less-experienced administrators, we liked the approach.

Visit our Web site at [www.fcw.com](http://www.fcw.com), where hotlinks to the vendors mentioned here are available for your convenience.





Firewalls Compared



CheckPoint FireWall-1 2.1

CyberGuard Firewall 3.0

Black Hole 3.0

Eagle NT

Products receive ratings from excellent to unacceptable in certain categories. Scores are derived by multiplying the weighting of each criterion by its rating, where:

- ★★★★ = Excellent = 1.0 Outstanding in all areas
- ★★★ = Very Good = 0.8 Meets all essential criteria and offers significant advantages
- ★★☆ = Good = 0.6 Meets essential criteria and includes some special features
- ★★ = Satisfactory = 0.4 Meets essential criteria
- ★ = Poor = 0.2 Falls short in essential areas
- = Unacceptable = 0.0 Fails to meet minimum standards or lacks a feature

Scores are summed, divided by 100 and rounded down to two decimal places to yield the final score out of a maximum score of 10.0 (plus bonus). Products rated within 0.2 points of one another differ little.

Company		CheckPoint Software Technologies Ltd.		CyberGuard Corp.		Milkyway Networks Corp.		Raptor Systems Inc.	
WEIGHTING		400 Seaport Court Suite 105 Redwood City, Calif. 94063 (800) 429-4391 www.checkpoint.com		2101 W. Cypress Creek Road Fort Lauderdale, Fla. 33309 (800) 666-4273 www.cyberguardcorp.com		4655 Old Ironsides Drive Suite 490 Santa Clara, Calif. 95054 (408) 566-0800 www.milkyway.com		69 Hickory Drive Waltham, Mass. 02154 (800) 9-EAGLE-6 www.raptor.com	
Installation	100	★★	40.00	★★★	80.00	★★★	80.00	★★★☆☆	60.00
Although CheckPoint's installation requires Unix script, the company has done everything possible to simplify the process. However, it's not as easy as a GUI-based installation program, and if you make a mistake in the script, you have to start over.									
Administration	150	★★★	120.00	★★★	120.00	★★★☆☆	90.00	★★★☆☆	90.00
CheckPoint's administration is very easy and includes remote capabilities. The program manages multiple firewalls and communicates via encrypted packets to ensure the firewall's security.									
Flexibility	150	★★★	120.00	★★★	120.00	★★★	120.00	★★★	60.00
CheckPoint offers a host of proxies plus packet filtering to allow virtually any realistic configuration. UDP support is thorough as well.									
Security	200	★★★★	200.00	★★★★	200.00	★★★★	200.00	★★★★	200.00
CheckPoint allowed only the expected traffic through in our security test.									
Documentation	100	★★★☆☆	60.00	★★★☆☆	60.00	★★	40.00	★★★☆☆	60.00
The manuals are concise and well-organized but don't adequately explain the installation process. Documentation for the administration and remote administration consoles is very complete.									
Technical Support	100	★★★	80.00	★★★	80.00	★★	40.00	★★★☆☆	60.00
CheckPoint's staff was very knowledgeable about their software and firewalls in general. They were able to solve our problems almost instantly and were very easy to reach.									
Support Policies	100	★★★	80.00	★★★☆☆	60.00	★★★☆☆	60.00	★★★☆☆	60.00
CheckPoint offers an available 24-hour support plan, and its Web and e-mail-based support provide ample resources for trouble-shooting or updates.									
Government Price (as of Jan. 13) Price for system and 150 users*	100	★★★☆☆	60.00	★★★☆☆	60.00	★★	40.00	★★★☆☆	60.00
\$13,285 (total) \$9,290 (1 to 250 users) \$3,995 (Suitable SPARC 5 system) Presidio Corp. GS-35F-3243D (301) 459-2200									
Reseller/Prime GSA No./Contract Phone	\$14,750 (total) \$11,250 (51 to 250 users)** \$3,500 (Suitable P133 system) Electronic Data Systems Corp. IC41 (800) 241-2143								
Final Score	1000		7.60		7.80		6.70		6.50
Remarks	CheckPoint is a good solution for government sites that need remote administration capabilities. Overall, this is one of the most solid packages we reviewed, but it still has a few rough edges, such as the installation process.								
CyberGuard offers a solid, turnkey firewall solution that is easy to administer, and the new interface was free of quirks that plagued previous versions. We'd recommend it to any government site that doesn't need to manage remote firewalls.									
Black Hole offers one of the easiest and most automated installation processes, but we have concerns about the focus on IP masquerading as a security function. Also, it lacked remote administration features.									
Eagle NT is one of the few firewalls available for the Windows NT platform. It features strong integration with NT's domain security and prevents unauthorized processes, but the package feels more like Unix than Windows NT.									

\*Prices for SPARC 5 and P133 systems are average prices and do not reflect a specific contract price. \*\*Expected/estimated prices





## Sidewinder Security Server 3.0

Secure Computing Corp.  
2675 Long Lake Road  
Roseville, Minn. 55113  
(800) 692-LOCK  
www.sctc.com

★★★ 80.00

Sidewinder comes pre-installed on a system, so we simply plugged it in and configured the root passwords. However, there are no backup tapes or boot disk, so if the system has problems in the future, you may be in for some downtime.

★★★ 120.00

Sidewinder offers support for SNMP, making it that much more integrated into a modern IP network. Also, it provides for remote administration — an important new feature.

★★★ 120.00

Sidewinder has a unique capability: mail filtering. This allows you to set rules for e-mail. It also supports proxies for most Internet protocols.

★★★★ 200.00

Sidewinder allowed only the expected traffic through in our security test.

★★☆ 60.00

The documentation is very comprehensive, and it's relatively easy to find relevant information. However, installation instructions are sparse, and the overall text is often unnecessarily technical.

★★☆ 60.00

Sidewinder's support staff was exceptionally knowledgeable, and they handled our problems promptly and accurately.

★★★ 80.00

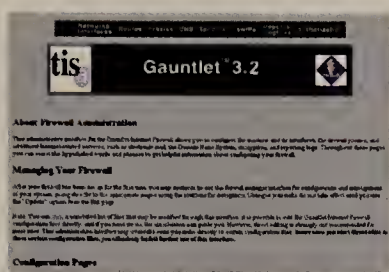
Sidewinder offers a two-year warranty on its turnkey system and offers an optional 24-hours, seven-days-a-week support plan. Its Web site is complete and informative.

★ 20.00

\$22,354 (total)  
(This is a hardware/software combination for 1 to 250 users.)  
EOS  
PC LAN +  
(800) 241-2143

7.40

**As the only product with e-mail filtering, Sidewinder is a must-have for agencies concerned with what's arriving over Internet mail. Also, it's a good choice for sites that need remote administration. However, we wish it came with backup materials in case of a network crash.**



## Gauntlet Internet Firewall

Trusted Information Systems Inc.  
15204 Omega Drive  
Rockville, Md. 20850  
(888) FIREWALL  
www.tis.com

★★★ 60.00

Gauntlet requires a minimal amount of contact with Unix, but the manual instructions are very clear. The installation script requires no user intervention, and because the proxies are transparent to the client machines, you don't have to reconfigure each one.

★★ 60.00

The Web-based administration is only secure when used from a host inside the firewall, defeating the purpose of remote administration. Also, packet-filtering capabilities are limited.

★★☆ 90.00

Gauntlet includes a wide range of proxies, and it provides packet filtering, although not as elegantly as some of the other products.

★★★★ 200.00

Gauntlet allowed only the expected traffic through in our security test.

★★★ 80.00

The documentation was clear and concise, and the installation manual would help even a Unix novice. Also, TIS provides provides great debugging documentation with this product.

★★☆ 60.00

Gauntlet's technical support staff answered quickly and gave us the proper solutions but didn't do anything beyond answering our exact questions.

★★★ 80.00

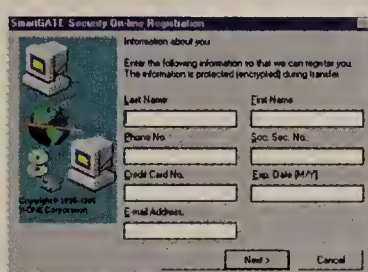
Gauntlet offers only 30 days of free support and a 30-day money-back warranty. The Web site is helpful but not one of the best. TIS provides optional support plans, including a 24-hours, seven-days-a-week plan.

★★☆ 60.00

\$12,125 (total)  
\$8,625 (unlimited users)\*\*  
\$3,500 (suitable P133 system)  
BTG (expected reseller)  
GS-35F-40360  
(800) 449-4228

6.90

**Gauntlet is a basic firewall that is best for Unix-savvy shops that don't need a more intuitive interface. The remote administration feature lacks some of the functionality of the other products. This product is good for smaller installations, especially those with only one firewall to maintain.**



## SmartWall 3.3.1

V-ONE Corp.  
1803 Research Blvd.  
Suite 305  
Rockville, Md. 20850  
(800) 495-VONE  
www.v-one.com

★★★ 60.00

SmartWall is very similar to Gauntlet in configuration, and the installation process requires little user intervention. However, a little Unix knowledge will make an administrator more comfortable with the installation.

★★☆ 90.00

V-ONE has included an intuitive Web management module. Although the Web-based administration is not elegant in design, its secure remote-access capabilities make up for any cosmetic limitations.

★★★ 120.00

SmartWall includes transparent proxies for every common protocol and a programmable plug-proxy that can support TCP-based protocols.

★★★★ 200.00

SmartWall allowed only the expected traffic through in our security test.

★★☆ 60.00

There was plenty of documentation to help with installation, administration and operation of the firewall. Documentation of the reporting functions is especially well-done.

★★☆ 60.00

V-ONE's staff seemed very knowledgeable about SmartWall, and they were able to answer our questions quickly.

★★★ 80.00

Available 24 hours, seven days a week, V-ONE is around for those late-night trouble-shooting sessions. A host of support options, including Web-based support, round out a complete support plan.

★★ 40.00

\$15,015 (total)  
\$11,515 (unlimited users)  
\$3,500 (Suitable P133 system)  
Government Technology Solutions Inc.  
GS-35F-41200  
(800) 999-4874

7.10

**SmartWall is best-suited for application-level firewalls. One major benefit is the solid Web administration capability. However, for organizations that need more control over the firewall traffic allowed in and out, it's not enough.**

## Installation

Because Sidewinder comes pre-installed on a system, we didn't have to do much to get it up and running. We simply plugged the unit in, brought it up and configured the root passwords. This approach is similar to CyberGuard's, but Secure Computing doesn't supply a backup tape or boot disks. For first-time installation, expect the Sidewinder product to be exceptionally easy, but if it has problems in the future, you may be in for some downtime.

Configuring the proxies' initial settings was fairly easy, though not as straightforward as some of the other products we tested. Like Gauntlet, Sidewinder is an application-level firewall only, which limits its flexibility but simplifies the installation process. Sidewinder gets a very good score for installation.

## Administration

While earlier encounters with Sidewinder's administration utilities left us bruised, Version 3.0 offers an enhanced GUI that's a vast improvement compared with Secure Computing's earlier efforts. We found it refreshingly easy to create users and assign their authentication methods.

Support for Simple Network Management Protocol is also a welcome addition to a firewall, making it that much more integrated into a modern IP network. The SNMP management information base provided with Sidewinder covers a plethora of firewall statistics, including incoming packets denied and authentication failures.

Additionally, Sidewinder, like CheckPoint, provides for remote administration — an increasingly important feature in today's IP-enabled enterprise. Sidewinder gets a very good score for administration.

## Flexibility

Sidewinder provides a wealth of configuration options, including proxies for most common IPs. It also provides generic proxies for both Transmission Control Protocol (TCP) and UDP traffic to allow additional proxies to be created.

One unique capability Sidewinder offers is its mail filtering. Administrators can configure rules for what Simple Mail Transfer Protocol electronic mail should be allowed through the firewall. Binary attachments can be banned, as well as e-mail containing key

words or exceeding a maximum size. Sidewinder also supports a wide range of authentication protocols. Sidewinder gets a very good score for flexibility.

## Security

Sidewinder's out-of-the box condition was pleasingly secure; once configured, it continued to prove itself secure. It also gets an excellent score for security.

## Summary

As the only product to offer e-mail filtering, Sidewinder is a must-have for agencies concerned with what's arriving (or leaving) over Internet mail. However, Sidewinder, like Gauntlet, feels like a Unix firewall. Serious Unix administrators may even prefer its wealth of options and switches. Sidewinder is another good choice for government sites that need remote administration of firewalls. This turnkey package was flexible and easy to administer, but we wish it came with backup materials in case of a network crash.

## SmartWall 3.3.1

SmartWall — like TIS' Gauntlet, which it resembles — is best-suited for application-level firewalls. For most installations, it's adequate. But for organizations that need more control over what traffic is allowed in and out, it's not enough. One benefit of SmartWall is that after you install it, it's barely noticeable, thanks to its solid Web administration package.

## Installation

SmartWall's configuration is very similar to Gauntlet's, which is not surprising because SmartWall is based on TIS' Firewall Toolkit. While the steps are easy and the documentation is clear, some Unix knowledge helps.

The installation proceeds with a minimum of user intervention and configures the firewall to be completely secure by default. The initial configuration is simple, and once a few basic parameters are configured, the remainder of the installation can be performed from the ample Web-based administrative tools. Overall, we rate installation good.

## Administration

One of V-ONE's advantages over Gauntlet is a robust, intuitive Web management module. While Web-based administration probably will never be as elegant as a properly designed administrative con-





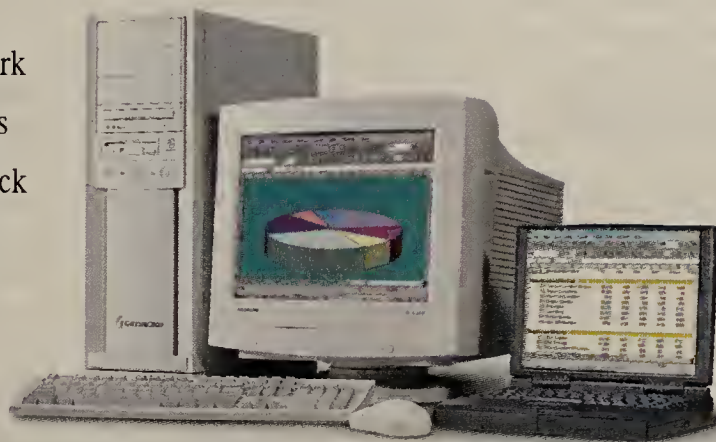


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## Sample GSA Configurations

### Professional Systems

#### P5-166

- Intel® 166MHz Pentium® Processor
- 16MB EDO DRAM
- 256K Pipelined Burst Cache
- Vivitron®500 (13.9" viewable) Color Monitor
- 2MB SGRAM Graphic Accelerator
- 2GB EIDE Hard Drive
- 3.5" Diskette Drive
- 12X CD-ROM Drive
- 7-Bay Mini Tower Case
- 104+ Keyboard
- Microsoft® Mouse 2.0
- MS® Windows® 95
- MS Office 95, Professional Edition
- 3-year Limited Warranty\*

**\$1922**

#### G6-200

- Intel 200MHz Pentium Pro Processor
- 32MB EDO DRAM
- 256K Internal Cache
- Vivitron700 (15.9" viewable) Color Monitor
- 4MB SGRAM Graphic Accelerator
- 2GB SCSI Hard Drive w/Controller
- 3.5" Diskette Drive
- 8X SCSI CD-ROM Drive
- 10/100 Fast Ethernet Network Card
- 12-Bay Tower Case
- 104+ Keyboard
- MS Mouse 2.0
- MS Windows NT® 4.0
- MS Office 95, Professional Edition
- 3-year Limited Warranty\*

**\$3073**

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#### S5-133

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- Casual Carrying Case
- MS Windows 95
- MS Office 95, Professional Edition
- 1-year Limited Warranty\*

**\$3461**



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Phone 605-232-2000 • Fax 605-232-2716



## GSA Schedule

### #GS-35F-3349D

Gateway accepts government IMPAC credit cards.  
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Prices shown are Gateway 2000's prices for sample configurations in accordance with the Price Reduction Clause. Prices shown include shipping FOB U.S. destination.

\*Call or write for a free copy of our limited warranty.



sole, the convenience of being able to securely administer the firewall from any location, using only a Web browser, more than makes up for cosmetic limitations.

Administration of SmartWall's variety of authentication protocols is very straightforward, and it's easy to configure users and their rights. SmartWall also differs from Gauntlet in its robust reporting facilities, which can be configured to track traffic down to the most minute detail. We rated administration good.

## Flexibility

SmartWall has transparent proxies for every common protocol as well as a programmable plug proxy that can support additional TCP-based protocols. The transparency of the proxies eliminates the need to individually configure client computers to use the firewall.

Support for several authentication schemes ensures that critical data will remain secure, and firewall-to-firewall encryption lets organizations with multiple locations establish a VPN with minimal effort. Like most firewalls, SmartWall doesn't support time- or date-based rules. Flexibility is scored very good.

## Security

After installing SmartWall and configuring it with our test set of rules, we didn't find any unexpected security holes. SmartWall's remote administration capability is fully encrypted, and its multiple authentication schemes proved secure as well. Like the others, SmartWall gets an excellent score for security.

## Summary

SmartWall is a no-nonsense firewall — as is Gauntlet — and we liked working with it from the start. However, SmartWall's Web-based administration is superior to Gauntlet's. If V-ONE would just add robust packet filtering and a good administration tool for the filtering, SmartWall would move to the front of the pack. SmartWall's most outstanding feature is its integration with V-ONE's other security products. Yet it is a fine firewall even when used independently of those products.

## Gauntlet Internet Firewall

We've always liked Gauntlet. It is one of the more basic firewall implementations, lacking a lot of the features that some others

have. Yet its very simplicity is alluring: By supporting a limited number of services, Gauntlet protects itself, and the network, from errors in configuration.

For a basic firewall that doesn't need to pass esoteric data types, Gauntlet is an excellent choice. Its proxies work easily and quickly.

However, for large installations, particularly where one administrator needs to configure and monitor multiple firewalls, Gauntlet isn't as attractive a choice.

## Installation

Gauntlet's installation process requires a minimal amount of direct contact with Unix — just enough to copy the floppy disks onto the hard disk and start a script. The instructions in the manual are perfectly clear and make the process easy, even for non-Unix types.

Unlike CheckPoint's script, Gauntlet's installation script requires no user intervention.

After rebooting the machine, the installation process continues from a remote machine.

Performing the base configuration is accomplished by accessing the firewall via a Telnet machine from any machine on the network. A series of straightforward menus guides the user through setting up the firewall's IP information and configuring the proxies. Because Gauntlet isn't a packet-filtering firewall, there are no rules to configure. And because Gauntlet's proxies are transparent to client machines, there's no need to walk around and reconfigure each client. Overall, Gauntlet gets a good score for installation.

## Administration

While Gauntlet purports to offer Web-based administration, we were disappointed that not all of its parameters could be accessed from its configuration pages. Instead, we found ourselves using a combination of the Web-based pages, text-based pages via Telnet

and manual editing of text files. Even its Web-based administration is only secure when used from a host inside the firewall — partly defeating the purpose of remote administration.

Gauntlet's packet-filtering capabilities are limited by an administration process that is more difficult than CyberGuard's or CheckPoint's because packet-filtering rules are implemented via the plug filter. No graphical representations of rules are provided, nor is there an easy way to make minor changes. That's why Gauntlet gets only a satisfactory score for administration.

## Flexibility

Gauntlet includes a wide range of proxies, from basic Web to RealAudio. Additionally, a plug-based proxy can be configured to allow TCP traffic between specific ports inside or outside the network — effectively providing a generic TCP proxy. For Internet Control Message Protocol or UDP

traffic, Gauntlet implements packet filtering, though not as elegantly as CyberGuard and CheckPoint. However, Gauntlet can't be configured with time- and date-based rules. We rated its flexibility good.

## Security

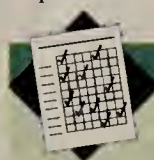
Gauntlet came up in a totally secure mode. After we configured it for our network, we confirmed that it was only allowing appropriate traffic through. It gets an excellent score for security.

## Summary

Gauntlet is a basic firewall that is best for Unix-savvy shops that don't need a more intuitive interface. The console administration is primitive but effective, while the Web-based administration has a decidedly unfinished feel to it.

## Black Hole 3.0

Black Hole impressed us from the minute we turned it on; it was obviously doing some serious



## HOW WE TESTED

# Firewalls

We looked at these firewalls as they would likely be used in a government environment. We modeled a small office with about 150 users who need Internet access. We configured a typical site — including electronic mail, news, World Wide Web, File Transfer Protocol and Gopher access — and allowed the outside world to access e-mail, Web and FTP servers.

We scored installation based on how long the product took to install as well as on how intuitive the process was. Products that could be installed with minimal difficulty by an administrator familiar with the operating environment received a score of satisfactory. Points were added for particularly easy installations, on-site installation assistance or any other feature that eased the process. We subtracted points from products with difficult, buggy or nonstandard installations.

We looked at administration from the perspective of an administrator responsible for the maintenance of the firewall. Products that could be configured easily, and whose user interface made configuration errors difficult, were awarded a score of satisfactory. We added points for products that had particularly easy and intuitive interfaces and remote administration capabilities and that made complex configuration changes easy. We lowered the score of products that had difficult user interfaces or whose interfaces would make detecting an error difficult.

A firewall's flexibility is very important. Proxy-based products ideally should have a generic proxy ability, while packet-filtering products should allow for all the major protocols. We gave a score of satisfactory to products that

supported all the basic Internet services: Hypertext Transfer Protocol, Passive FTP, Gopher, Network News Transfer Protocol and mail. From there, we raised the score for products that supported Active FTP, User Datagram Protocol-based applications such as Real Audio, and other common Internet applications. Products that supported a wide range of authentication methods received additional points. We also added points for products that support IP address translation or date- and time-based rules. We subtracted points from products that couldn't perform one of the basic Internet functions; products that couldn't perform two or more basic IP functions received an unacceptable score.

Security, of course, is a firewall's main function. We tested the firewalls using Internet Security Systems Corp.'s Internet Scanner. We awarded a score of excellent to products that, when installed, allowed no traffic through whatsoever. We deducted points from products that allowed "harmless" traffic, such as Internet Control Message Protocol pings, through. Any product that allowed substantial network activity to occur received a score of unacceptable.

Furthermore, we retested the firewalls after configuring our base set of rules. Any product that allowed unexpected traffic through received a score of unacceptable. (Even harmless unexpected traffic is a sign of a serious design flaw in a firewall.)

We scored support policies based on our expectation that products as critical to network security as firewalls should have support beyond what's offered for office suites. We awarded a score of satisfactory to products with an Internet-based support site and support available 24 hours a day, seven days a week, even if it

came at an additional cost. We added points for products that included free support beyond 9 a.m. to 5 p.m. and Monday through Friday, and for products that offered free upgrades to new versions.

We also placed calls to each company's technical support staff and evaluated the timeliness and the quality of the response we received.

We looked at the products' documentation with an appreciation of the times it's most likely to be used: at installation, to explain how the firewalls' features work and for trouble-shooting. We awarded a score of satisfactory to products with adequate installation instructions and a clear explanation of how to use the product to implement network security.

We added points for products that included detailed tutorials on network security and for products that provided easy installation guides. We subtracted points from products that provided confusing, inaccurate or incomplete documentation.

While price shouldn't be anyone's primary consideration when purchasing a firewall, it nevertheless plays a part in the decision-making process. We looked at what it would cost to set up each product in our hypothetical office, including the software and hardware included and not included. We scored products on a linear scale: Products with a total cost of less than \$5,000 received a score of excellent; products costing \$5,000 to \$9,999 received a very good; products costing \$10,000 to \$14,999 received a good; products costing \$15,000 to \$19,999 received a satisfactory; and products priced at more than \$20,000 received a poor score.



Unix maneuvering but without asking a lot of questions. This software automatically handles most of the firewall installation process.

Black Hole's administration wasn't as complete as CheckPoint's, but it still had the kind of modern user interface that really helped us use the firewall. While some features weren't where we expected them to be, after a little bit of learning we found the interface exceptionally easy to use.

## Installation

Because Black Hole includes its own modified BSDI kernel, you have to install the operating system and the firewall application. Fortunately, Milkyway has done a superb job with its installation program. The installation process is simple and painless.

No familiarity with Unix is assumed; the installation process takes care of installing the firewall-only operating system entirely on its own.

One very nice feature of Black Hole is its transparent proxies. This feature alone will save quite a bit of installation time for most environments. Black Hole gets a very good score for installation.

## Administration

Black Hole's GUI administration utility is one of the friendliest of the bunch. The utility makes editing users and groups very easy — including drag-and-drop support. It was very simple to create a group, drag users into it and then assign the entire group a security policy.

Black Hole automatically disguises internal addresses when they're sent to the outside network unless a specific host or subnet is explicitly exposed to the outside world. Defining those hosts or subnets, though, wasn't as intuitive as it could have been. Still, with a little digging, most administrators should have no problem with the process.

The authentication techniques that Black Hole supports are easy to assign to users or groups, and configuring date- and time-based rules is straightforward.

The only feature we missed in Black Hole was secure remote configuration. Black Hole gets a good score for administration.

## Flexibility

Black Hole provides proxies and packet filtering — and complete transparency for both. Together, the two methods support all the basic IP services, plus UDP-based

services. It also supports date- and time-based rules for proxies and packet-filtering criteria. Several authentication methods are available. Black Hole gets a very good score for flexibility.

## Security

Black Hole's initial installation proved completely secure, and it only allowed the expected traffic after we configured it for our network. It also gets a score of excellent for security.

## Summary

Black Hole offers one of the easiest and most automated installation processes. And by using transparent-proxy technology, it eliminates the need to install proxy software on all the network clients — a boon for administrators of large government networks.

However, we have mixed feelings about Black Hole's focus on IP masquerading as a security function. It's a handy feature and appropriate for a lot of installations, but we preferred CyberGuard's approach of leaving masquerading off by default and providing a simple check box to turn it on.

## Eagle NT

Eagle's Unix-on-Windows-NT feel made us a little uneasy. X Window on a Unix host feels natural and looks right. On an NT server, the screens were downright unnerving.

One innovative feature Raptor includes is a process that prevents unauthorized programs from running on that same server. One of our concerns with running a firewall on Windows NT was the possibility for sabotage from either inside or outside the network. Raptor has gone out of its way to prevent that from happening, but this approach somewhat eliminates one reason for using NT in the first place: being able to set up a multipurpose server.

Raptor's limited support for unusual data types also constrains its usefulness to locations that don't need terribly sophisticated Internet access.

## Installation

Raptor's Windows NT offering is very easy to install, although its overall feel betrays its close relationship to the Unix product.

Like most Windows NT products, Eagle installs using the familiar X:SETUP method and asks only a few straightforward ques-

tions during the installation. Basic firewall setup is accomplished in one dialog box, which allowed us to configure the proxies as well as notification options.

We liked Eagle's automatic Domain Naming System proxy configuration, which automatically picks up the names of internal computers, simplifying the process of setting up a split DNS configuration.

Like Gauntlet, Eagle doesn't perform packet-level filtering, so installation is considerably simplified. Eagle gets a good score for installation.

## Administration

Eagle's administration program isn't as robust as CheckPoint's or CyberGuard's, but that reflects the relative simplicity of the firewall. We were able to configure the proxies, including limiting access to specific sites, easily from the Hawk configuration program.

Creating users and configuring their authentication method is straightforward. Eagle even supports using the Windows NT domain as the user database, making the elusive goal of a single log in a little closer for NT shops.

What we didn't like about the program is its X Window feel. While Eagle is one of the few pro-

fessional-quality Windows NT firewalls out there, it doesn't live up to its promise of being natural for Windows NT administrators. Unix administrators will be right at home in this program, but they'd probably buy the Unix version instead. We rated Eagle's administration good.

## Flexibility

Eagle provides transparency for most of the major IP services: File Transfer Protocol, HTTP, Telnet and SMTP. Additional TCP-based protocols can be made transparent using the Generic Service Provider, and IP address translation can be enabled or disabled at will. Unfortunately, there's no real support for UDP-based applications or RealAudio.

While the authentication methods are adequate, there's also no support for time- and date-based rules. Eagle gets a satisfactory score for flexibility.

## Security

Like the others, Eagle was perfectly secure when first configured and acted as we expected when we configured it for our test scenario. We rated it excellent for security.

## Summary

Eagle is one of the few firewalls available for the Windows NT platform. It features strong integration with NT's domain security and prevents unauthorized processes, but the package feels more like Unix than Windows NT. If you can get past the annoying interface, you'll find Eagle to be a solid, well-behaved application. ◀

*Talley is the associate technical manager at InfoWorld. He can be reached at Brooks\_Talley@infoworld.com.*

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# Great Graphics

## The Best Color Printers You Can Buy

► WRITTEN BY DANIEL M. VERTON

► TESTING BY CHARLES PETTIROSSI

With more government users demanding color for their presentations and reports, the need for color workgroup printers is on the rise. Our test center analyzed six color laser printers in terms of their speed, output quality, ease of use and affordability. We also evaluated three less-expensive alternatives to laser printers. Which one you should buy depends on your needs.

**B**riefings and presentations are an important part of everyday life for government professionals, and those who understand the fundamentals of business communications know that color pictures and graphics speak louder than words. However, nothing will sabotage your presentation faster than poor-quality transparencies, graphics that are difficult to read or a printer that takes too long producing your last-minute changes.

Our test center analyzed nine color printers, including six lasers, two ink-jets and one solid-ink. These systems range in price from \$2,000 to \$8,000. Before buying one of these printers, you need to decide which technology is best for your workgroup.

Laser technology leads in overall color print quality. Color laser printers are fast, produce the best-quality photo reproductions and are durable. However, they're also more expensive than competing technologies. Color lasers are best suited for large workgroups that produce volumes of color output on a daily basis.

A good alternative to color lasers is the solid-ink printer from Tektronix Inc. The one we tested was faster than the laser printers and sells for half the price. It was the best for slides and transparencies, and its graphics were nearly as good as the color lasers. However, it stumbled on photo reproduction (see Notes From the Test Center, Page 22).

For workgroups with occasional color printing needs, a thermal ink-jet printer may do. This is the least costly technology, but it is also the slowest. And many of these printers require expensive specialty paper for optimal performance (see Notes From the Test Center, Page 24).

Visit our Web site at [www.fcw.com](http://www.fcw.com), where hotlinks to the vendors mentioned here are available for your convenience.



Another issue to consider with color printers is total cost of ownership. The cost per page for color printing remains higher than for black-and-white printing. You need to consider not only the price of the printer but also the price of the "consumables," the ink and paper required to use it (see chart, Page 19).

To measure output quality, we conducted a "taste test," where we asked eight users to evaluate the output of the various color printers without identifying which printer produced the images. We also benchmarked the speed of the printers and analyzed their design and features.

Our choice for the best-value color laser printer goes to Tektronix's Phaser 550, which had an overall score of 8.37. Solid results in our taste test, a rating of very good in system design and excellent technical support helped power the Phaser 550 to its first-place finish. Hewlett-Packard Co.'s Color LaserJet 5M, however, finished a close second with a score of 8.12. It also turned in solid results in the taste test and in system design, but a higher price and lower score in documentation gave the Tektronix machine the push it needed to take the first-place position. Also worthy of an honorable mention is the Magicolor CX from QMS Inc., which finished in third place with a final score of 7.87. The Magicolor's overall image quality was very competitive and is definitely worth considering.

### Tektronix Phaser 550

The Phaser 550 came in third place overall in our speed tests. It finished well ahead of the HP and Xerox Corp. machines in the Microsoft PowerPoint color slide presentation and the color text and graphics tests, with times of 54:43 and 30:05 respectively. Its time of 4:44 on the black-and-white text document was also almost 1 minute faster than the QMS printer.

Powering the Phaser 550 is an Advanced Micro

Devices Inc. 32 MHz reduced instruction-set computing (RISC) processor. The Phaser 550 offers either 600-by-600- or 1,200-by-1,200-dots-per-inch (dpi) resolution. The Phaser 550's configuration also offers parallel and SCSI-2 interfaces. Overall, the Phaser 550 gets a very good in system design.

Setup and ease of use for this printer were rated very good. A 10-step quick-start guide provided simple, easy-to-follow instructions, good diagrams and helpful information on installing toner cartridges, the fuser and the imaging unit. Toner cartridges are installed into color-coded rails located directly behind a side access panel. In addition, although the fuser unit is a little heavy, conveniently located handles help make the installation of this component manageable.

Tektronix also provides a utility called PhaserLink, which allows system administrators to remotely access

### AT A GLANCE

## Color Laser Printers

### Pricing

\$5,900 to \$7,500, depending on configuration.

### What's Selling

Affordable quality color is here to stay.

### Where to Find Bargains

The GSA schedule and agency contracts.

### What to Specify

Look for a system that provides a good balance between image quality and speed. Network compatibility and overall system expandability are also important factors.





the Phaser 550 via standard World Wide Web browsers. With PhaserLink, administrators can configure, manage and trouble-shoot the printer from anywhere in the enterprise. The company also provides on-line help and documentation as well as a print job status accounting tool to help track who has used the printer and the materials that have been exhausted.

Setting up the Phaser 550 on our Novell network was simplified by using Tektronix's PhaserShare Administrator software. With this utility, users do not need to use NWAdmin or PConsole to create a print server, print queue, user access or bindery context.

Our test unit came configured with a 10Base-T Ethernet adapter with BNC and RJ-45 connectors and provided support for EtherTalk, Novell NetWare and Transmission Control Protocol/Internet Protocol (TCP/IP).

The Phaser 550 produced some of the highest-quality graphics and images in this review. It was on par with the HP LaserJet 5M, which finished first in our taste test. Banding and dithering (a pattern of dots on the page) problems were at a minimum, and transparencies were very good. The Phaser 550's color output features rich tones and a shiny gloss-like finish. Although picture clarity improved slightly with 1,200-by-1,200 dpi, we didn't notice a substantial increase in the quality of the graphics and photos.

Given the Phaser 550's superior color output and highly competitive print speeds, you would be hard pressed to find a job that it could not handle efficiently and effectively. You can find the Phaser 550 on NASA's Scientific and Engineering Workstation Procurement contract for \$5,903.

HP Color LaserJet 5M

Despite having the slowest time on the text and graphics test (38:44) and the second-slowest performance on the PowerPoint presentation (1:12:35), the Color LaserJet 5M finished first in our taste test and took second place in the overall review.

The LaserJet 5M was configured with a 40 MHz AMD RISC processor and 36M of memory. For printer resolution, the HP uses a 300-dpi printer engine that is combined with HP's own Resolution Enhancement Technology, which produces 1,200-dpi-equivalent output. We gave the LaserJet 5M a score of excellent for system design.

HP earned a rating of very good for setup and ease of use. A separate quick-start guide accompanied the printer and provided comprehensive instructions on setting up and installing the system. Toner is loaded via four specially designed bottles that snap into a cartridge holder in the back of the unit. By sliding a color-coded tab mechanism, both the bottle and the toner receptacle are opened. With just a few taps on the bottle, the toner is easily transferred to the printer with minimal spillage. All other components — including imaging units, black and color developer, print drum, transfer belt and fuser — were also easily installed.

Install wizards made it very easy to prepare the system for network use. HP's JetAdmin software allows users to install, configure and manage HP printers connected to networks. JetAdmin also allows for remote access and configuration of printer settings. The LaserJet 5M ships with a built-in LAN adapter that supports Ethernet and LocalTalk connectivity via RJ-45, BNC and DIN-8 connectors.

The LaserJet 5M's first-place showing in our taste test was the result of high-quality output, with virtually no evidence of dithering patterns in photos and only very minor incidents in some graphics. Colors were deeper and brighter on the HP slides than on the slides from other machines. All text, whether color or black,

THE CONTENDERS

- Canon U.S.A. Inc.'s C LBP 360PS, available on the GSA schedule. Score: 6.49
- Hewlett-Packard Co.'s Color LaserJet 5M, available on the GSA schedule. Score: 8.12
- Lexmark International Inc.'s Optra C, available on the GSA schedule. Score: 7.24
- QMS Inc.'s Magicolor CX, available on the GSA schedule. Score: 7.87
- Tektronix Inc.'s Phaser 550, available on the GSA schedule, NASA's Scientific and Engineering Workstation Procurement (SEWP and SEWP II) and NIH's Electronic Computer Store. Score: 8.37
- Xerox Corp.'s XPrint 4920 Plus, available on the GSA schedule. Score: 6.69

was clear and crisp. Even on transparencies, the HP printer was able to produce high-quality solid color fills with little or no evidence of dithering.

Although not one of the fastest printers in the review, the HP printer clearly produced the best color. The Color LaserJet 5M can be found on the General Services Administration schedule from GTSI Inc. (GS-35F-4120D) for \$6,921.

QMS Magicolor CX

The QMS Magicolor CX posted solid speed results, and its third-place finish was well ahead of the rest of the field. It was the third-fastest printer in the PowerPoint presentation test with a time of 53:09, and it finished a competitive 33:07 in the color text and graphics test. It also finished just under a minute behind the Tektronix printer on the black-and-white text document, with a time of 5:40.

QMS powers the Magicolor with a 40 MHz RISC processor and 32M of RAM that can be upgraded to 64M. The printer offers 300-, 600- and 1,200-dpi print resolution. However, 1,200 dpi requires a minimum of 40M of memory. Although our taste-test slides were produced at 1,200-by-600 dpi, our speed evaluation was conducted with the standard 32M of memory, which defaults the system to 600-by-600 dpi.

The Magicolor incorporated a unique design feature that allows the printer to accept two font cards via slots located below the control panel. In addition, a security card can be plugged in so that only authorized users can change printer configurations. Overall, the design score was excellent.

The Magicolor unit received a very good score for setup and ease of use, in large part because of QMS' superb quick-start guide. In addition, installation of the printer's major components was easy. However, a few minor glitches remain to be worked out with regard to QMS' CrownAdmin2 administration and installation software. We experienced minor problems using it with NetWare 4.1 and were forced to default to NWAdmin to install the printer on our network.

Our test unit came configured with a 10 megabit/sec Ethernet adapter. RJ-45, BNC and AUI connectors are provided for twisted-pair, ThinNet and ThickNet cabling. Buyers can also choose an optional Token Ring interface. Connections to PC and Macintosh environments are supported, including NetWare, EtherTalk, TCP/IP and LAN Manager/LAN Server.

The Magicolor's 1,200-by-600-dpi resolution produced very high-quality color graphics and photos that clearly rivaled the HP machine. In fact, virtually no difference existed between the Magicolor transparencies and those from the HP printer. However, on some business graphics, minor dithering patterns were noticeable on lightly colored solids. There were also minor incidences of white lines between solid color fills and border lines. Although the Magicolor's colors are very good, they are extremely shiny and put off a glare at various angles in the light. This tends to make some images look slightly grainy.

Although the Magicolor is slightly more expensive than the HP and Tektronix printers, its 1,200-by-600-dpi resolution produces high-quality graphics and photos. The Magicolor CX is available on the GSA schedule from Westwood Computer Corp. (GS-35F-3322D) for \$7,748.

Lexmark Optra C

Despite its slower 25 MHz AMD RISC processor, Lexmark International Inc.'s Optra C finished second in overall speed, with the notable exception of falling more than 10 minutes behind the Canon on the PowerPoint test. It pumped out our 75-page color text and graphics document in 29:11 and a 30-page black-and-white document in 2:51. However, the Lexmark machine may have sacrificed color quality for faster turnaround time. It had a fourth-place finish with a score of 7.24.

The Optra C is a four-color continuous-tone laser printer that uses a Canon engine and is capable of 600-by-600-dpi resolution. Overall, the Optra C received a very good score for system design.

Setup and ease of use for the Optra C were rated very good. Although no quick-start guide was provided, the user manual provided a helpful section on getting started. Loading printer components — such as toner cartridges, the oil bottle and toner waste bottle — was easily done through side and front access panels. Lexmark also provides a CD-ROM with all the Windows 95 print drivers.

Our machine came with a 10 megabit/sec-capable MarkNet XL internal network adapter for Token Ring and Ethernet support. An RJ-45 port and BNC connector were also provided. With the Optra C, Lexmark ships its MarkVision printer management utility. MarkVision provides system administrators with the ability to monitor and control printer settings within Windows 95, NT Server, NetWare, OS/2, Macintosh, LAN Manager, TCP/IP and Unix operating environments. We particularly liked MarkVision's ability to replicate the control panel on the computer screen.

Although the Optra C's speed was very good, it did not fare as well with respect to its print quality. Business graphics suffered from slightly faded colors and mysterious white lines between solid color fills and border outlines. There was also evidence of dithering on many of the solids. In addition, dark color bands could be

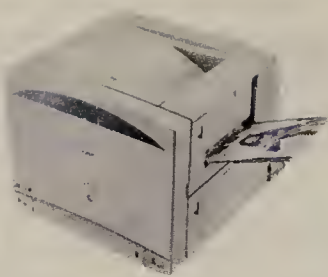
Government Toner Prices

	Canon	HP	Lexmark	QMS*	Tektronix	Xerox
Color Toner	\$111	\$31	\$119	\$121	\$254/ \$255**	\$144
Black Toner	\$95	\$7	\$84	\$55	\$178	\$37

\*Developer also required, which is \$181 per color.  
\*\*Cyan and yellow are \$254, but magenta is available for \$255.



Color Laser Printers Compared



		C LBP 360PS		Color LaserJet 5M		Optra C		Magicolor CX	
Company		Canon U.S.A. Inc. 2110 Washington Blvd. Suite 150 Arlington, Va 22204 (703) 807-3400 www.usa.canon.com		Hewlett-Packard Co. 3000 Hanover St. Palo Alto, Calif. 94304 (800) 752-0900 www.hp.com		Lexmark International Inc. 2275 Research Blvd. Suite 360 Rockville, Md. 20850 (800) 258-8575 www.lexmark.com		QMS Inc. 1 Magnum Pass Mobile, Ala. 36618 (800) 523-2696 www.qms.com	
WEIGHTING									
Maximum Resolution		600x600 MIPS 100 MHz		1,200x1,200* AMO 40 MHz		600x600 AMO 25 MHz		1,200x600 OT 40 MHz	
Speed (in hours/min./sec.)	100	1:22:26	100.00	1:54:51	71.77	1:24:30	97.55	1:31:56	89.67
		Fastest machine on the PowerPoint and color Word documents, thanks to a 100 MHz processor. Slow at B&W text.		Very slow on our PowerPoint test, but competitive on the color and B&W Word documents. Speed evaluated while printing at 1,200x1,200 dpi.		Second-fastest printer in the review, with solid speeds across the board.		Strong competitor when it comes to speed. Times were comparable with the Lexmark and Tektronix machines.	
Image Quality	75	★★★	45.00	★★★	60.00	★★	30.00	★★★	60.00
		Color quality was very good on photos, but browns and blacks looked faded when compared with the HP.		Rated as very good and the best overall of the field.		Overall image quality was rated as satisfactory, with evidence of minor flaws, such as dithering and banding.		One of three machines capable of 1,200-dpi resolution, its overall image quality clearly rivaled the HP.	
Business Graphics	75	★★★	45.00	★★★	45.00	★★	30.00	★★★	45.00
		Canon printed a white line between solid color fills and black border lines, but the overall quality was good.		There was virtually no evidence of dithering patterns in photos and only minor incidents in some graphics.		Suffered from slightly faded colors and a white line anomaly on graphs and charts.		Minor dithering patterns were noticeable on lighter colors, but the overall quality was still good.	
Color Text/Graphics	75	★★★	45.00	★★★	60.00	★★	30.00	★★★	45.00
		Overall, the Canon handled the color text and smaller-scale graphics best.		All text, whether color or black-and-white, was clear and crisp.		Rated as satisfactory but contained some of the same flaws noted above.		Crisp and clear.	
Setup/Ease of Use	150	★★★	90.00	★★★	120.00	★★★	120.00	★★★	120.00
		Our used evaluation unit from Canon did not receive the typical installation and unpacking procedures. All internal components were easily installed.		A quick-start guide provided comprehensive instructions on setting up and installing the system. All major components were easily installed.		No quick-start guide was provided, but the user's manual has a helpful section on getting started. A CO-ROM with printer drivers was easy to use.		QMS offers a very helpful quick-start guide. In addition, installation of the printer's major components was very easy.	
System Design/Expandability	100	★★	40.00	★★★★	100.00	★★★	80.00	★★★★	100.00
		The Canon was configured with a 250-sheet cassette and a 100-sheet multipurpose tray, bi-directional parallel and SCSI-2 ports, RJ-45 Ethernet connection and an AUI (attachment unit interface) connector. Shipped with 32M of memory that can be upgraded to 48M.		The HP uses a 300-dpi printer engine that produces 1,200-dpi-equivalent output. The HP was configured with 36M of memory upgradable to 76M. A 250-sheet tray is standard; another 250-sheet tray is optional.		A standard 250-sheet paper tray and a 100-sheet multipurpose tray cover the Optra's paper handling. It can handle letter, legal, A4 and B5 paper sizes. The Optra comes with 8M of memory standard (our machine shipped with 32M) and can be upgraded to 64M.		The printer accepts two font cards via two slots below the control panel. A security card can be plugged into either slot. The unit ships with 32M of RAM, upgradable to 64M, but 1,200 dpi requires at least 40M. Standard paper cassette holds 250 sheets; optional feeder holds 250 more.	
Compatibility	75	★★★	60.00	★★★★	75.00	★★★★	75.00	★★★★	75.00
		Operating systems supported: DOS, Windows 3.1, 95, NT, Mac and Unix.		Operating systems supported: Windows 3.1, 95 and NT, Mac, OS/2 and several flavors of Unix.		Operating systems supported: DOS, Windows 3.1, 95, NT, OS/2, Mac and several flavors of Unix.		Operating systems supported: DOS, Win3.1, 95, NT, Mac, OS/2, Unix (IBM AIX, HP-UX, Solaris, Sun OS).	
Documentation	50	★★	20.00	★★★	30.00	★★	20.00	★★	20.00
		A quick-start guide would have been very helpful during installation. Although we rated the documentation as satisfactory overall, the glossary, trouble-shooting section and readability were all rated as good.		The separate quick-start guide was very helpful and didn't bog us down with too much detail. Readers will find the user's guide to be nicely organized and detailed and very helpful for inexperienced users.		The documentation is relatively easy to read and includes a good trouble-shooting section that provides recommended corrective actions to selected problems.		The system manual, user's guide and reference guide are all crammed into one three-ring binder, making it very difficult to manipulate. But there was a separate booklet that covered quick setup procedures.	
Technical Support	50	★★★	30.00	★★★★	50.00	★★★★	50.00	★★★★	50.00
		Technical support varies depending on the reseller supplying the printer.		Excellent. Questions were answered immediately.		Excellent. Questions were answered immediately.		Excellent. Fast and very helpful.	
Support Policies	50	★	10.00	★★★	30.00	★★	20.00	★★★	30.00
Warranty			90 days	1 year		1 year		1 year	
On-Site Service			Reseller/dealers decide length/price.	1 year		1 year		1 year, fee-based	
Money-Back Guarantee			No	No, but replacement at no cost.		No		No	
Fax-Back Support			Yes	Yes		Yes		Yes	
Toll-Free Line			No	Yes		No		Yes	
Other Support			In-house BBS, CompuServe	In-house BBS, Internet		In-house BBS, Internet		In-house BBS, CompuServe, AOL, Internet	
Support Hours			8:30 a.m. — 4:30 p.m. M-F (Metro O.C.)	6 a.m. — 10 p.m. M-F (MST) 9 a.m. — 4 p.m. Sat. (MST)		10 a.m. — 7 p.m. M-F (EST)		7 a.m. — 6 p.m. M-F (CST)	
GSA Price (as of Dec. 10)	200	\$7,192	164.15	\$6,921	170.58	\$6,898	171.15	\$7,748	152.37
Reseller/Prime			Canon U.S.A.	GTSI		Lexmark International		Westwood Computer	
GSA No./Contract			GS-35F-3049D	GS-35F-4120D		GS-35F-31870		GS-35F-33220	
Phone			(703) 807-3400	(800) 999-4874		(800) 258-8575		(800) 800-8805	
Final Score	1000	6.49		8.12		7.24		7.87	
Remarks			The Canon seemed to handle small-scale color photos and graphics best. Slow performance on B&W documents does not make this a good choice for a dual-use color and B&W printer.	Although a little slower on the PowerPoint test, the HP produces very high-quality color products and can handle large business reports extremely well.		Due to its slightly higher price and minor print flaws, we recommend the Optra C to workgroups that put out reports with a moderate number of graphics.		The Magicolor's 1,200-dpi resolution produces high-quality graphics and photos. With competitive times in all three speed categories, the QMS is well-suited for just about any print job.	

\*Although the Color LaserJet 5M has a 300-dpi engine, HP has included Resolution Enhancement Technology to give the product 1,200x1,200-like resolution.





## Phaser 550

**Tektronix Inc.**  
**26600 Southwest Parkway**  
**P.O. Box 1000 M/S 63-63**  
**Wilsonville, Ore. 97070**  
**(800) 835-6100**  
**www.tek.com**

1,200x1,200  
 AMD 32 MHz

1:29:32 **92.07**  
 With less memory and a slower processor, the Phaser still finished ahead of the HP on the PowerPoint test.

★★☆ **45.00**  
 The Phaser's color output featured rich tones and a shiny gloss-like finish to business graphics.

★★☆ **45.00**  
 The Phaser produced some of the highest-quality graphics and images in this review.

★★★ **60.00**  
 Sharp, clear and well-done.

★★★ **120.00**  
 A quick-start guide provided simple instructions and diagrams on installing toner cartridges, fuser and imaging unit, which were easy to install.

★★★ **80.00**  
 At 18 inches high and 19 inches wide, the Phaser was the most compact printer in our review. Although our unit shipped with only 24M of memory, it can be upgraded to 72M. The standard paper tray holds 250 sheets, but optional trays can increase capacity to 750 sheets.

★★★★ **75.00**  
 Operating systems supported: Windows/DOS, OS/2, Mac and Unix platforms.

★★★ **40.00**  
 Tektronix provided four separate and comprehensive documents to cover the PhaserShare software, system administration, user manual and printer reference.

★★★★ **50.00**  
 Excellent. Questions were answered promptly and accurately.

★★☆ **30.00**  
 1 year  
 90 days or 1 year return to depot  
 No  
 Yes  
 Yes  
 In-house BBS, CompuServe, AOL, Internet  
 6 a.m. — 5 p.m. M-F (PST)

\$5,903 **200.00**  
 GTSI  
 NASA's SEWP  
 (800) 999-4874

**8.37**

**Given the Phaser's superior color output and highly competitive printing speeds, you would be hard pressed to find a job that it could not handle efficiently and effectively.**



## XPrint 4920 Plus

**Xerox Corp.**  
**80 Linden Oaks Parkway**  
**Rochester, N.Y. 14625**  
**(800) 34-XEROX**  
**www.xerox.com**

600x600  
 AMD 25 MHz

2:12:48 **62.07**  
 The XPrint 4920 Plus seemed to have a tough time handling our PowerPoint presentation, taking more than 25 minutes longer than the HP.

★★ **30.00**  
 Satisfactory overall. However, images were slightly faded, particularly around the edges.

★★ **30.00**  
 Minor banding could also be discerned on several images, as well as blotchy, faded areas within solids.

★★ **30.00**  
 Text was fine, but graphics were slightly faded.

★★ **60.00**  
 Minor problems made it difficult and messy to load print toner. However, overall the score was satisfactory.

★★★★ **100.00**  
 An automatic paper jam recovery feature is very helpful. The system ships with 16M of memory standard and can be expanded to 48M. Our unit shipped with 32M. The paper tray holds 250 sheets; an optional high-capacity feeder holds 1,500 sheets.

★★★★ **75.00**  
 Operating systems supported: DOS, Windows 3.1, 95, NT, OS/2, Mac and Unix (OS and Solaris).

★★★ **40.00**  
 The user's guide was rated as excellent for readability and organization. However, there was no coverage of the latest printer driver for Windows 95.

★★★★ **50.00**  
 Excellent. Questions were answered promptly and accurately.

★★ **20.00**  
 1 year  
 1 year  
 No  
 Yes  
 Yes  
 Internet  
 8 a.m. — 6 p.m. M-F (EST)

\$6,861 **172.07**  
 CGES  
 GS-35F-4044D  
 (800) 321-2437

**6.69**

**If you can live with the minor problems we experienced with the output, Xerox's design, compatibility and technical support make the 4920 Plus a good buy.**

seen on background colors.

Although it handles print jobs very quickly and has no problems with color text, some may find the Optra C's \$6,898 price on the GSA schedule (GS-35F-3187D) to be a little high given its minor banding and dithering problems on plain paper and transparencies.

## Xerox XPrint 4920 Plus

An overall score of 6.69 placed the Xerox machine in fifth place. The XPrint 4920 Plus seemed to have a tough time handling our PowerPoint presentation, taking more than 25 minutes longer than the HP system with a time of 1:38:23. It fared much better, however, on the color text and graphics test and on

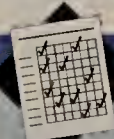
the black-and-white text test, posting competitive times of 31:12 and 3:13 respectively. Unfortunately, we were not able to get Xerox's updated printer driver — which is two versions higher than the one provided to us — in time for this review. This may have contributed to the XPrint's slower time on the presentation test.

The XPrint's system design was excellent. Powering our evaluation unit was an AMD 25 MHz RISC processor and 32M of RAM. The XPrint also automatically recovers paper jams by reprinting jammed pages once the system has been cleared. Rounding out this solid design is 600-by-600-dpi resolution.

Setup and ease of use, however,

was not one of its strong points, earning only a satisfactory score. No quick-start guide was provided, and we had a few minor problems during installation. For example, one of the toner cartridges shipped with a reversed holding strip (which holds the toner in the cartridge until installed), making it very difficult and messy to load the toner. Fortunately, all other components were easily installed through side access panels.

We were also required to download Xerox's DS/P (Document Services for Printing Software) administration utility, which was only available for Windows 3.1. By creating Windows 95 shortcuts to the executable files, we were able to run



## HOW WE TESTED

# Color Laser Printers

## Speed

We scored speed based on the time it took to print pages created with Microsoft Corp.'s PowerPoint and Word applications. We calculated printer speed as the time from selecting Print "OK" to the time the last page hit the output bin for each of our test suites: black-and-white text only (30 pages), color text with graphics (75 pages) and color presentation graphics (38 slides). We used a variety of Microsoft Excel charts to generate color graphics and imported several file types (bitmap, clip art, etc.) into the PowerPoint slide presentation. We scored overall print speed mathematically: The fastest system received the most points possible. All other units received a percentage of the maximum points based on their slower performance.

## Output Quality

We gathered a panel of eight color printer users to judge the output from the printers. Each panelist received a packet of seven identical printouts in the following categories: photo images, business graphics and color text. They were asked to judge the output in terms of color depth and uniformity, text and image sharpness, and overall image quality. We tallied the scores of the panel to come up with overall word scores — poor, satisfactory, good, very good or excellent — for each printer in these three areas.

## Setup/Ease of Use

Issues that determined this score included how easy and intuitive it was to unload the printer from the carton, load the printer components — including the fuser, toner and imaging unit — and install drivers for Windows 95. We also evaluated how easy it was to connect the printer to a NetWare 4.1 network with NetWare Directory Services using the vendor's printer administration program. Units received extra points for quick-start guides. We considered how well the control panel interface was designed and how easy it was to use. We also evaluated how easy it was to modify printer configuration settings and considered the usefulness and capability of the printer administration software. A word score was then assigned to each printer.

## System Design/Expandability

The system design score was based on ease of access for clearing unwanted paper jams, control panel features and whether manual paper feed was available. We also considered how the paper trays were designed and whether trays could handle multiple media types (envelopes, labels, transparencies). Printers that had energy-saving features were awarded extra points.

The expandability score was based on the number of standard ports that shipped with the printers, the availability of additional paper storage space and the amount of memory needed to obtain maximum-resolution printing. Maximum memory capability was also included. In addition, we considered the number of fonts that came embedded in each printer.

## Documentation

At a minimum, documentation had to tell us how to set up and use the system and had to include accurate diagrams to illustrate the text. Comprehensive, well-organized and well-written manuals received higher scores.

We lowered the score if the manual was poorly organized, lacked a table of contents and index, did not include installation information or contained errors.

## Technical Support

We based technical support scores on the quality of service we received during anonymous support calls. We asked typical questions regarding installation and use of the printers, including minor trouble-shooting.

## Support Policies

A one-year warranty covering parts and labor with unlimited technical support from the vendor earned a satisfactory score. We awarded additional points for extended warranties, unconditional money-back guarantees, on-site service included in the purchase price, extended support hours, on-line support and a toll-free number.

## Pricing

We based our pricing on the GSA schedule price of the color printer with the amount of memory in our test unit. We scored the price mathematically: The lowest-cost system received the maximum points possible. All other units received a percentage of the maximum points based on their price.



DS/P from our desktops. In addition, we had to flash upgrade the system's Ethernet adapter software, which took five attempts before successfully installing.

For networking the XPrint, Xerox provides Macintosh LocalTalk and RS-232 interfaces standard and also offers a Token Ring option. Our system shipped with a 10Base-T/10Base2 10 megabit/sec Ethernet adapter with RJ-45, BNC and LocalTalk connections.

Although Xerox's color output was rated as satisfactory, minor problems were evident when compared with the output from other printers. Images and business graphics were slightly faded, particularly around the edges of charts. Minor banding could also be discerned on several images, as well as blotchy, faded areas within solids. Transparencies also suffered from fading. These problems, however, were not significant enough to cause the rating to fall below satisfactory.

If you can live with the minor problems we experienced with the XPrint's output, the system's design and compatibility — and Xerox's technical support — make the XPrint a good buy. Unfortunately, many users will find the slow printing speed on graphics

Printer Speed Scores — Hours, Minutes, Seconds

	Memory	Resolution	Overall Speed	Graphics/Images	Color Text/Graphics	B/W Text
Canon C LBP 360PS	32M	600x600	1:22:26	41:03	29:58	11:25
HP Color LaserJet 5M	36M	1,200x1,200	1:54:51	1:12:35	38:44	3:32
Lexmark Optra C	32M	600x600	1:24:30	52:28	29:11	2:51
QMS Magicolor CX	32M	600x600	1:31:56	53:09	33:07	5:40
Tektronix Phaser 550*	24M	600x600	1:29:32	54:43	30:05	4:44
Xerox XPrint 4920 Plus**	32M	600x600	2:12:48	1:38:23	31:12	3:13

\* Ran speed tests at standard mode setting; image tests at 1,200 dpi.

\*\* Xerox has a brand-new driver out that is two versions higher than the one we used.

presentations unacceptable.

You can find the XPrint 4920 Plus on the GSA schedule (GS-35F-4044D) from Comark Government & Educational Sales for \$6,861.

Canon C LBP 360PS

Canon's strategic alliance with California-based Electronics for Imaging Inc. has provided the company with a powerful 100 MHz Fiery XJE RISC 64-bit controller that helped power the C LBP's first-place fin-

ish in our PowerPoint test. The Canon machine also finished a close second in the color text and graphics test, falling just 47 seconds behind the Optra C.

A poor score in support policies and terrible performance results on the black-and-white text speed test (11:25) relegated the Canon system to last place.

The Canon printer produces 600-by-600-dpi resolution and supports 39 Type I fonts and True Adobe PostScript Level 2. We rated the Canon satisfactory for sys-

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FCW test center NOTES FROM THE TEST CENTER

Another Great Buy

Tektronix's Phaser 350 Puts Out a Solid Performance

As we assembled the lineup for our color printer comparison, we ran into a quandary: Where do we put the Phaser 350 from Tektronix Inc.? This unique, solid-ink printer uses different technology than either the color laser printers or ink-jet printers we reviewed. As it turns out, we were so impressed with this machine's performance that our test center team has chosen it as the first recipient of our new Technical Excellence Award (see From the Editor, Page 5).

When it comes to color quality, the Phaser 350 significantly beats the ink-jets and closely rivals the lasers. It also finished well ahead of the fastest laser machine on our Microsoft Corp. PowerPoint speed test. Furthermore, the Phaser's \$3,351 price, coupled with Tektronix's offer of free black ink, puts the Phaser 350 at half the price of competing color lasers.

The Phaser 350 provides 300-dpi resolution (standard) with an optional configuration capable of rendering 600-by-300 dpi. It's configured with 8M of memory that can be upgraded to 24M. Other standard features include a 32 MHz RISC processor, a SCSI disk port and Adobe PostScript support. For network connectivity, buyers can opt for an Ethernet or Token Ring connection.

Phaser 350 Speed Scores — Minutes

9-Slide PowerPoint Presentation	5:32
10-Page Color Text/Graphics Word Document	4:14
Laser-Class PowerPoint Test	30:33

Setting up the Phaser 350 for network use is accomplished through the PhaserShare Administrator wizard and is relatively simple. However, for agencies that are running NetWare 4.1 using NDS, there is still quite a bit of manual configuration that has yet to be incorporated into the available setup wizards. This can cause significant delays, but it was a problem that we experienced with most of the printers we tested.

Tektronix bundles a special remote printer management utility called PhaserLink. PhaserLink lets users and administrators remotely monitor and manage the printer's status and configuration through common World Wide Web browsers. Regardless of whether the local network is Novell IPX, Token Ring or Apple EtherTalk, a TCP/IP connection brings printer status, configuration, on-line documentation and Tektronix technical support to the remote desktop via the Web.

Preparing a solid-ink printer like the Phaser 350 is a snap. Our evaluation unit came pre-loaded with four nontoxic ColorStix solid-ink sticks (cyan, magenta, yellow and black) that eliminate the mess of dealing with toners. Each stick easily slides into one of four loading bins located under the top cover. Excess ink created during operation is gathered in a maintenance tray that slides out from behind the front panel. Should there be a need to clean up, the Phaser 350 ships with its own cleaning kit. Dealing with ink has never been easier.

Once the printer is set up and running on your network, a small screen on the front control panel keeps you informed of the printer's status. It takes a while for a solid-ink printer to warm up, which it must do in order to melt the ink. When it



reaches 75 percent in its warm-up cycle, the Phaser 350 will begin to melt the ink and automatically print a cleaning page and a configuration page. Because the Phaser 350 purges itself of all unused ink when turned off and takes several minutes to warm up, we recommend only shutting it down when absolutely necessary.

For business presentations and graphics, the speed and quality of the Phaser 350 were unmatched. When tested against the ink-jet machines using the nine-slide Microsoft PowerPoint presentation test, the Phaser 350 posted an impressive time of 5:32 — less than half the time it took the HP DeskJet 1600CN. The Phaser 350 also won the competition for fastest color document printer, churning out a 10-page Microsoft Word document that combined text and colorful business graphics in only 4:14. In addition, its performance speed of 30:33 on our 38-slide PowerPoint presentation test was more than 10 minutes faster than the best laser machine. Users will also appreciate the fact that the Phaser 350's output is dispensed in order, so there's no rearranging required after a large print job.

The Phaser 350 also produced great color with only minor flaws noticeable. Even on normal copier paper, the Phaser 350's colors were bright and deep.

Depending on the quality of the image you are printing, you can expect the Phaser 350 to suffer from light to moderate dithering patterns. Sharp laser-class text is possible with both color and black-and-white, and the quality of overhead transparencies is the best of the bunch.

Tektronix also offers good support policies. Included is a one-year warranty covering parts, labor and shipping, and one year of return-to-depot service. Tektronix aims for an eight-hour turnaround time with its 90-day on-site service option. Free and unlimited technical support is available Monday through Friday from 6 a.m. to 5 p.m. PST.

Tektronix's offer of free black ink also helps make the Phaser 350 a good deal. Not only can you call Tektronix for a shipment of black ink whenever you need it, but every time you order a supply of color ink, Tektronix will automatically include black ink free of charge.

The Phaser 350 offers significantly better images and faster performance than the ink-jet machines. And although it's a bit noisy, it offers laser-quality color graphics at half the price. Overall, the Phaser 350 is a great solution for budget-minded agencies.

Phaser 350		
Speed	30:33	100.00
Image Quality	★★★	60.00
Business Graphics	★★★	60.00
Color Text/Graphics	★★★	60.00
Setup/Ease of Use	★★☆	90.00
System Design	★★☆	60.00
Compatibility	★★★★	75.00
Documentation	★★★	40.00
Technical Support	★★★★	50.00
Support Policies	★★☆	30.00
GSA Price	\$3,351	200.00
Final Score		8.25



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## HP Color LaserJet 5 Printer

- Photorealistic color output provided by HP Image Resolution Enhancement technology 1200
- "Print permanent" laser output won't fade, run, melt or peel
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- Fast color printing, from 2-3 ppm, 10 ppm for black & white

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#866-27137 Schedule B/C  
Also available on SEWP, NIH, Ohio State

## HP DesignJet 755CM Printer

- Professional near-photographic quality with HP inkjet technology
- Vibrant, presentation-quality output in up to 16.7 million bold, brilliant colors
- Prints poster-size images up to 3 by 9 feet
- Accepts a wide range of media—including coated papers, glossy papers and films, and clear and matte film
- HP ColorSmart technology automatically optimizes color output for vibrancy, clarity and balance



**\$6,563**

#866-83653 Schedule B/C

## HP DeskJet 1600C Printer

- High-resolution output with HP's Resolution Enhancement technology (REt) and ColorSmart provides professional black and full-color printing at the touch of a button
- HP ColorSmart technology allows printing of 16.7 million colors
- Fast, high-volume performance with up to 4 ppm color printing and up to 9 ppm black text
- Accepts plain paper, labels, enveloped, transparencies, and HP Premium media
- HP JetDirect network allows plug-and-play installation and hands-off operation in virtually any network environment

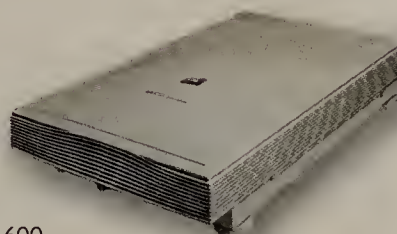


**\$1,279**

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## HP ScanJet 4C Scanner

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- 30-bit color and 10-bit grayscale scanning capture more than a billion colors and more than a thousand shades of gray
- Includes easy-to-use scanning software with automatic settings, and Caere OmniPage Limited Edition OCR with HP AccuPage technology
- Comes with Corel PHOTO-PAINT 5 (Windows) or Adobe Photoshop LE (Macintosh) for professional-quality results



**\$816**

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## Ink-Jets Prove Good for Beginners

► DANIEL M. VERTON

Advances in nonlaser print technologies have brought cost-effective color capability to thousands of home offices and corporate workgroups across the country. There was a time when you needed a laser printer to produce high-quality color documents or presentations. Today, however, technology is quickly closing the gap between laser and nonlaser printing.

We reviewed two ink-jet printers that are good choices for small workgroups and organizations just getting into color production. The two thermal ink-jets we tested were Lexmark International Inc.'s 4079 Plus and Hewlett-Packard Co.'s DeskJet 1600CN.

Ink-jets are much more affordable than lasers, priced at less than \$2,000. However, ink-jet printers do require more expensive coated paper for optimum image quality. Ink-jets are also noticeably slower than either lasers or the solid-ink printers, so they won't work for production environments.

Ink-jet printers are a more appropriate solution for workgroups that are on a tight budget and occasionally produce color graphics or charts. However, if you find that you're consistently printing five or more color pages or transparencies per day, the ink-jet's costly consumables and slower printing speeds may make the solid-ink printer a better choice.

### HP DeskJet 1600CN



Our test results for the HP DeskJet 1600CN show that this printer is better suited to workgroups that primarily print black-and-white text combined with a light to moderate number of color graphics. It posted a time of 5:24 on the Microsoft Word document black-and-white text test. On a 10-page Word document that combined color text and graphics, the HP finished at an impressive 7:35. Finally, it beat the Lexmark machine by almost 15 minutes in a nine-slide PowerPoint

presentation test at a speed of 11:25. Also worth noting is that the DeskJet did all this with a slower processor and the same amount of memory as the Lexmark machine.

The DeskJet is one of three network-capable color ink-jets offered by HP. It includes all the standard features of the base model 1600C, such as the ColorSmart printer driver, an Intel Corp. 32-bit 20 MHz RISC microprocessor, a bi-directional status feedback monitor, TrueType screen fonts and a standard 4M of memory that can be upgraded to 100M. While the 1600CN does not include Adobe PostScript Level 2 support, it does come with an optional 500-sheet paper tray.

The DeskJet is a four-color printer that uses four high-capacity print cartridges for cyan, magenta, yellow and black. It provides 600-by-600-dpi resolution when printing basic black text and 300-by-300 dpi for color. The unit ships with a standard 180-sheet paper input tray. Automatic and manual feeds are available for plain paper, film and labels; there is also a manual feed for envelopes.

The DeskJet came configured with a JetDirect print server card for Ethernet and LocalTalk network connectivity. An optional JetDirect card can be purchased for Token Ring networks. HP's JetAdmin utility provides network administrators with the ability to remotely manage the DeskJet. Unfortunately, we had to download many of the Windows 95 versions of these software utilities and drivers from the World Wide Web, which caused us minor delays in getting set up. HP's JetAdmin software is also available for Windows 3.1, IBM OS/2 LAN Server, HP-UX(1), SunOS and Solaris.

In terms of color quality, the DeskJet's PowerPoint presentation revealed slight fading and a lack of color depth. There were also minor incidents of banding present. Still, when printing lighter colors on large-scale business graphics and photos, the HP's dithering patterns were not quite as noticeable as they were on the solid-ink Tektronix Inc. Phaser 350 (see Notes From the Test Center, Page 22) and some of the laser machines. The same was true on the Word document that mixed text with color graphics and photos.

We recommend the DeskJet to workgroups that require laser-quality black-and-white text that incorporates a moderate number of color graphics or photos. This printer seems well-suited for producing

colorful business reports. However, if you're looking for a printer to handle your slide presentations, the DeskJet's slower speed and lack of color depth may not make it your best choice. Priced at \$1,866 on the GSA schedule from Electronic Data Systems Corp. (GS-35F-3109D), organizations looking to take that first step toward color production can't go wrong with the DeskJet 1600CN.

### Lexmark Color Jetprinter 4079 Plus



The standard configuration of the 4079 Plus includes a 25 MHz AMD 32-bit RISC processor, 4M of memory and a slightly higher 360-by-360-dpi resolution capability. However, the unit we tested performed poorly on our speed tests. Yet it provided decent print quality when compared with the HP DeskJet.

Although it had the same amount of memory as the HP system, the Lexmark printer couldn't handle the entire nine-slide (3.73M) PowerPoint presentation we used in our testing. As a result, we were forced to reduce the print job to seven slides (just over 2M in size). Although the Lexmark printer was able to handle the seven slides, it did so at a sluggish time of 26:03. We recommend, therefore, that you upgrade the 4079's memory using an 8M, 16M or 32M memory module or the 40M hard disk option.

The Lexmark printer also finished behind the HP on the Word document black-and-white and color tests. With a time of 1 hour and 17 minutes to print a 31-page black-and-white text document, the Lexmark printer is too slow to recommend for dual use. It was also more than three times slower than the HP unit when printing the color text and graphics document, posting a time of 28:20.

Because the ink from ink-jet printers easily soaks into plain paper, it is necessary for the print head to make multiple passes over the same area to

produce the required color saturation. Because we set these printers to print at their highest possible quality, the 4079's double-pass standard for bold black and quality print, as well as its four-pass standard for plain paper, may explain its slower results.

Setting up the 4079 for network operations was similar to setting up the other nonlaser machines. Network connectivity was provided by an external MarkNet XLe network adapter. The 4079 also uses Lexmark's MarkVision management utility, which provides users with the ability to remotely administer print jobs and control panel settings.

Besides the XLe network adapter, the only other setup requirements are the paper guides, and power and network cables. The entire configuration fits on a single desktop and is compatible with Windows (95, 3.1, 3.11), OS/2, AIX and AppleSystem 7.5.

Taste-test results for the 4079 were surprising. Its business graphics were on par with those of the HP. In fact, although some of the Lexmark printer's colors were not as bright as the HP's, the 4079 did not suffer as much from dithering patterns. However, when printing dark overlapping colors (black text over a dark-blue background), the Lexmark's output was harder to read than that of the HP.

The print quality of the Lexmark 4079 improves dramatically when specially coated papers and photo-quality paper are used. However, these papers are more expensive and can dramatically increase your printing costs if used on a regular basis. Therefore, we recommend keeping a stock of specially coated paper on hand to use only for special reports and presentations.

The Lexmark 4079 Plus is a good machine to introduce your small or medium-size workgroup to color printing. Because of its slower printing speeds, it is probably best-suited for organizations that produce fewer than five color pages per day. If you buy this printer, be sure to upgrade the memory. The Lexmark 4079 Plus costs \$2,492 on the GSA schedule.

### Summary

For roughly \$2,000, the HP and Lexmark machines offer a cost-effective way to break into color production. But slower speeds and special paper needs will continue to render these ink-jet printers the low-volume color print solution.

### Ink-Jet Printer Speed Scores — Hours, Minutes, Seconds

	9-Slide PowerPoint Presentation	10-Page Color Text/Graphics Word Document	31-Page Black-and-White Word Document
HP DeskJet 1600CN	11:24	7:35	5:24
Lexmark Color Jetprinter 4079 Plus	26:03*	28:20	1:17:00
Tektronix Phaser 350 (Solid Ink)	5:32	4:14	8:07



PRINTERS

From Page 22

tem design. Setup and ease of use for the Canon printer was also rated as satisfactory. However, we received a used evaluation unit and did not have to go through the typical installation and unpacking procedures, such as removing spacers and locking screws. All internal components were easily installed, with the procedures for installing the toner cartridges and waste toner bottle being very similar to the Lexmark printer. Although Canon warns users to never turn on the printer without the silicon oil bottle being installed, the referenced section of the getting-started guide was missing, which could cause a problem for less-experienced users.

Network connectivity was provided via a 10Base-T Ethernet adapter. The Canon machine also supports TCP/IP, Novell IPX and AppleTalk simultaneously. The printer's RJ-45 port provides a connection for twisted-pair wiring.

In addition, ThinNet (with optional transceiver) and Thick-Net cabling are supported via the unit's AUI connector.

Although color quality on most business graphics and photos was good, some browns and blacks were faded compared with the first-place HP machine. The Canon also suffered from the same mysterious white line between solid color fills and black border lines that was present on slides from the Lexmark machine. In addition, the Canon printer's shades of blue appeared more like purple on paper.

Of particular concern was the appearance on almost every slide of a strange pattern of blotches that was most evident on dark, solid background colors. This may have been the result of an oil leak. The Canon machine's performance on transparencies was also quite poor, with severe evidence of dithering and large areas of faded color.

The Canon printer handled small-scale color photos and graphics best. Because of its slow speed on the black-and-white text document, we do not recommend it for use as both a color and a black-and-white printer.

Despite recent price reductions, the Canon printer's \$7,192 price is still one of the high-

est in our review. This price, however, reflects a slightly different configuration than our evaluation unit. Although the new configuration will come with less memory (16M), it will include several new features, such as updated software, an energy-saving mode and

Web tools. The Canon C LBP 360PS can be found on the GSA schedule from Canon Government Marketing Direct Sales (GS-35F-3049D) and is also available on the IC4I contract.

Summary

The top three systems — from Tektronix, HP and QMS — all offer very good color production. The most significant difference among these systems is the price, with an \$1,845 difference between the Tektronix and QMS machines.

If you're looking for speed, consider the QMS Magicolor CX. If you're looking for a bargain system, the Tektronix Phaser 550 is a great buy. And if you care most about color quality, we recommend the HP unit. ◀

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	1200 dpi	600 dpi	Max. PPM	PostScript™ Support	Mfr.'s List Price
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HP® LaserJet® 5	NO	YES	12	Opt (\$459)	\$1,629
IBM® NP 12	NO	YES	12	Opt (\$299)	\$1,599
Single Console Integration					Industry Support
HP OpenView® for Windows, IBM TME 10 NetFinity, IBM NetView®/6000, Novell® ManageWise®					SNMP Printer MIB, NPAP, DMI Printer MIF
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## ACQUISITION ANSWER MAN

### Ridiculous Memory Advice

**Q.** I'm astounded at the lack of knowledge of the Acquisition Answer Man when it comes to RAM prices. On Page 25 of the Jan 6. supplement he says: "As a side note, \$89.95 is a great price for 8M of memory. Memory prices have come down dramatically in the last six months, and it seems that they are as low as they will get for the foreseeable future."

What planet are you on? 8M modules going for \$27 or sub-\$30 are not at all uncommon on the market and most definitely warrant the modifier "great." \$40 is high but still not totally off the charts. \$60 is a scam artist/contractor/government vendor milking acquisition types for all they're worth. \$90 is highway robbery and should land the vendor in jail.

The General Services Administration schedule nonsense is nothing more than legalized bilking of the taxpayers' money by way of government contracts. I would expect you, as a publication catering to the public sector, to confront the evil head on.

If you're going to expound on prices, stop reading GSA schedules, which are inflated at least two times the going rate, and do some market research. There is absolutely no need for agencies to buy GSA, particularly

when its track record has been abysmal in providing services on par with the global marketplace. Remember the antidrug campaign when faced with hyperinflated pricing from GSA, the National Institutes of Health or any other "contract": Just say no! If enough people do that and magazines such as yourself also call for this kind of abstinence, we'll put the whole GSA bureaucracy, as well as the notion of federal contract buying, out of business, which is its natural and proper state.

Matthew Patton

**Q.** In the Jan. 6 supplement, the Acquisition Answer Man says that \$89.95 is a great price for 8M of memory. Is the government really paying that much? Eight megs are priced as low as \$39 in many local computer stores. I hope the contractors are not taking advantage of the government.

Master Sgt. Michael J. Kelly  
Marine Corps Institute  
Washington, D.C.

**Q.** In the Jan. 6 supplement, the response to the last letter states that "\$89.95 is a great price for 8M of memory." Hello! It has been a relatively long time since \$89.95 was a great price for 8M of memory. On Jan. 4, 16M SIMMs were selling for \$69 at the Market Pro show in Chantilly, Va. Even computer stores such as CompUSA and Computer City are selling RAM for only a little more.

On the other hand, if 8M SIMMs are relatively expensive

right now, it is probably due to scarcity because of low demand. With RAM so cheap and memory requirements ever increasing, why bother with 8M SIMMs unless your old motherboard requires them? In any case, I'm confident that 8M SIMMs can be purchased for around \$35.

Rodger Hoover  
General Services Administration

**A.** As Dear Abby would say, I deserve 20 lashes with a wet computer cable for that answer. I mistakenly quoted the \$89.95 as a great price for 8M of RAM when it should have been for 16M of RAM. But you bargain hunters seem to have done much better than I did. By all means, buy a 16M RAM upgrade if you can find it priced under \$70.

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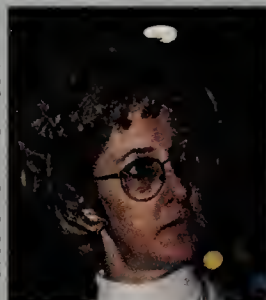
## REQUEST FOR COMMENTS

COMPILED BY ELANA VARON

### Does your office have a color printer?

What kind is it? How do you use it?

PHOTOS BY STAN BAROUH



"Yes, we have numerous different types. We use them for demonstrations and conferences."

— Sheila Feishell, a human resources program manager with the Commerce Department, said color printers help to liven up planning documents.



"No, we don't have a color printer. I think it would be helpful."

— James Fisher, director of administrative services for the Virginia Department of Accounts, said he hasn't had the money for this equipment in his budget.



"We don't have one. I'm sure our public affairs office might use it more, but we're in the policy area."

— Marilyn Legnini, a Freedom of Information Act officer with the Bureau of Land Management, said that because her office uses Unix systems, having a color printer would be too expensive.



"We have one or two in the building, but they aren't in wide use at this point. The cost of printing is very expensive."

— Arlington County, Va., school librarian Natasha Pomar said she would like to make color printers available to high school seniors to print maps and graphs for special projects.



"Yes. We're scanning our map collection to have them available on the Internet, and a lot of this material we print."

— Juan Carlos Vega, a library technician with the Library of Congress' National Digital Library program, said House and Senate members are the main requesters of map printouts.



"We've got a [Hewlett-Packard] color printer. We print reports, so if we have illustrations that require color, we can have [it] if we need it."

— At the National Park Service's Applied Archaeology Center, where Matthew Virta is laboratory director, color printers help enhance drawings of artifacts the office has studied.

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**133 MHz Pentium Notebooks Compared**

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IBM	IBM Corp. 221 Hill Street Armonk, NY 10504 (914) 722-4100 http://www.ibm.com	\$1,499.00	149.00	149.00	149.00	149.00	149.00	149.00	149.00	149.00	8.15
HP	HP Inc. 1515 Page Mill Road Sunnyvale, CA 94086 (415) 722-4100 http://www.hp.com	\$1,499.00	149.00	149.00	149.00	149.00	149.00	149.00	149.00	149.00	6.65
ThinkPad	IBM Corp. 221 Hill Street Armonk, NY 10504 (914) 722-4100 http://www.ibm.com	\$1,499.00	149.00	149.00	149.00	149.00	149.00	149.00	149.00	149.00	8.05

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# Intranets & the 'Net

Covering: Internet Technologies and Services  
for Collaboration and Electronic Commerce

## Briefs

■ **Security Dynamics Technologies, Inc.**, maker of the SecurID dynamic-password smart card and ACE/Server 2.0 network authentication product line, last week offered details about Version 3.0 of its server. The product can exchange user authentication information with other ACE/Servers, which lets traveling employees access corporate network resources by using their SecurID cards at remote offices.

Security Dynamics also intends to extend the ACE/Server so it can issue and manage digital certificates, said Dave Power, a company vice president. ACE/Server 2.0 and 3.0 will be adapted to support Remote Authentication Dial-In User Service and TACACS standards for authentication, as well as the Lightweight Directory Access Protocol.

■ **VeriSign, Inc.** has teamed with electronic commerce research consortium **Commerce-Net**, electronic data interchange vendors **AT&T, Premenos Corp.** and **Sterling Software, Inc.**, and start-up **Actra Business Systems**, to test the use of X.509 certificates over the Internet.

VeriSign is opening a Web-based enrollment site called *Get-EDI Center*, where EDI trading partners can offer digital IDs for EDI transactions.

■ **The Sun-Soft, Inc.** division of Sun Microsystems, Inc. has started shipping its Common Object Request Broker Architecture (CORBA)-based client/server development environment, **Solaris NEO 2.0**, which lets developers combine objects written in C, C++ and Java. NEO 2.0 also includes a bridge to translate among software objects based on CORBA and Microsoft Corp.'s Common Object Model, according to Jon Williams, a SunSoft product manager.



Williams

## Auditioning future stars of the network market

Venture capitalist's interest in start-ups has 'Net flair.

**Q&A** Since starting Hummer Winblad Venture Partners in 1989 with partner John Hummer, Ann Winblad has emerged as one of the most prominent venture capitalists in the country. The firm's \$95 million software-only fund has made investments in three dozen companies, including Farallon Communications, Inc. and Powersoft Corp.

Winblad spoke with *Network World* Senior Writer Chris Nerney about how Hummer Winblad selects start-ups to invest in and the role net managers play in the process.

Your business is to look into the future. How far into the future can you see in the Internet and intranet space?

Pretty far. The thing that happens when you have a broker's fund like we do is that you audition thousands of entrepreneurs a year.

After a while, you start to get a road map of what is going to happen because you know where the intellectual capital is going with their time, energy and inventions.

So how clear do we see the future?

Probably clearer than even the companies we invest in by the time we invest. We are auditioning the future. That is our job.

What will be the big Internet and intranet markets in the next couple of years? A lot of people are touting "push" technology.



Winblad says curious network managers should call venture capitalists.

Push technology is great, and there are 50 or 60 vendors that can push this stuff now. Of course, it's going to be incorporated into Microsoft's operating system, it's going to be in the [user interface]. It's already in the [user interface] of Netscape's browsers, so who are all these companies, and how do they have a business?

Second, does it really meet the problem? No, it's just another way of surfing. Instead of going into the waves, "push" has the waves come to you. That is not the answer. The answer is a multitude of probably not-yet-invented or not-yet-seen tools.

So what future technologies do you like?

Collaborative filtering is using statistical modeling to profile customers. I can decide I want to become a profiled customer, so I tell you a bit about myself, and you know what I bought last. This technology takes into account these interests and buying patterns and builds a profile so only information relevant to you is presented. This is a very important technology for a company disseminating information.

The process you use to select companies seems thorough.

Does that process leave any room for gut feelings?

All in all, the gut has to enter there because you never get facts. You just get a potential piece of market real estate that looks like a good investment. Part of using our gut is we co-opt the customers into our decision process. We have a database of corporate net managers, and [we ask them]: "If someone built this, would you buy it? If it was available today, how much would you pay for it?" Many times they

say, "I never thought about that. Does someone have it? I'd like to see it," like they're champing at the bit. If they completely don't get it, that's a problem.

What can network managers do to separate the strong companies from the weak?

They can call the investors. A lot of companies do that. They say, "Hey, these are professional investors. They are accustomed to determining who has less grist than the other." ■

## SourceCraft targets Java-based intranet apps development

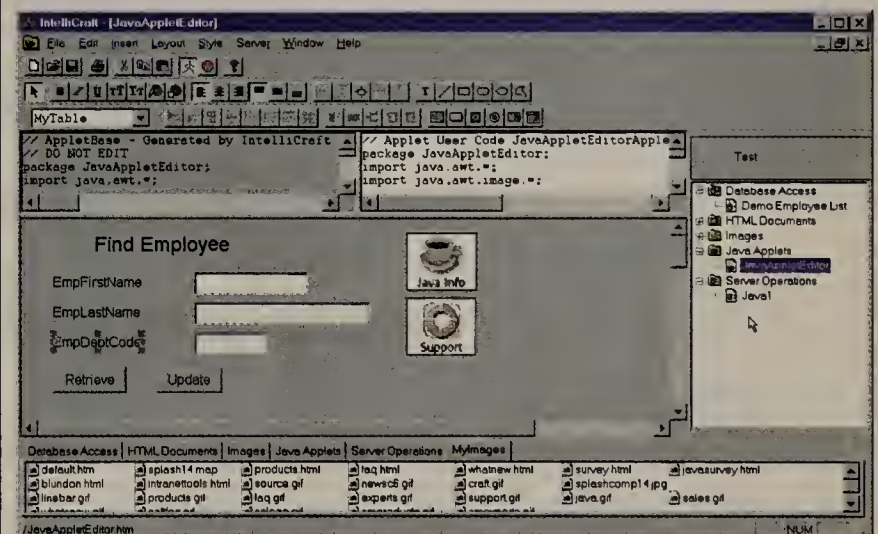
By Ellen Messmer  
Burlington, Mass.

Start-up SourceCraft, Inc. has taken the wraps off an intranet software development tool for writing applications in HTML, Java and ActiveX that have links to back-end databases.

The drag-and-drop development tool, called IntelliCraft, lets

Java, as well as Simple Mail Transfer Protocol mail services, is bundled with an HTML editor. The software supports both Netscape Communications Corp.'s Web programming API, Netscape Server API, and rival Microsoft's Internet Server API.

And if you want to use push technologies to send informa-



SourceCraft's IntelliCraft Java-based development toolkit includes support for the database vendor's new stored procedure language specifications for Java.

users build in access to back-end databases based on Open Database Connectivity (ODBC) and Java Database Connectivity (JDBC) standards.

IntelliCraft also includes support for the proprietary extensions to SQL that Oracle Corp., IBM, Informix Software, Inc. and Sybase, Inc. formulated to give developers a way to use Java to execute stored procedure SQL queries.

IntelliCraft, which comes with its own HTTP server written in

tion regularly to select individuals on your intranet, IntelliCraft lets you do that with its narrowcast technology, said William Blundon, SourceCraft president and chief operating officer.

IntelliCraft, now in beta, is expected to ship today in a standard edition that includes support for JDBC and ODBC. The Preferred Edition, with support for proprietary stored procedure APIs based on SQL, will ship March 15.

©SourceCraft: (617) 221-5665.

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- Ann Winblad's bio
- Background on her firm, Hummer Winblad Venture Partners
- A primer on venture capitalists

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## INSIDER

# 'If governments act appropriately...'

In a somewhat schizophrenic draft document, the U.S. government has published a road map of the directions it intends to follow in establishing

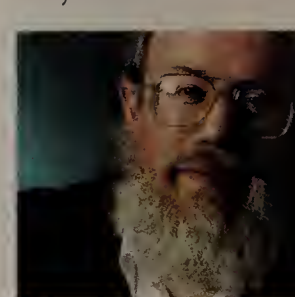
"A Framework for Global Electronic Commerce," which can be found on the Internet at [www.iitf.nist.gov/electcomm/glo\\_comm.htm](http://www.iitf.nist.gov/electcomm/glo_comm.htm).

The framework starts out paying homage to the Global Information Infrastructure (GII), the network that was going to replace the unreliable, academically oriented Internet. The document then tries to include the Internet by saying it is a force that embodies the GII trend. (And all this time I thought the Internet was living the tale the GII tried to tell.)

Anyway, it is a pretty good draft, and it proposes five principles for "international discussions or agreements to facilitate the growth of commerce on the Internet." The principles are: 1) the private sector should lead; 2) governments should avoid undue restrictions on electronic commerce; 3) where government involvement is needed, its aim should be to support and enforce a predictable, minimalist, consistent and simple legal environment for commerce; 4) governments should recognize the unique qualities of the Internet; and 5) electronic commerce over the Internet should be facilitated internationally.

The draft warns against new taxes on 'Net commerce. Current taxes are OK — if you buy a car using a Web browser, you are not exempt from taxes. Figuring out where the sale was made and which government gets the money will be fun.

The draft's authors seem worried — with cause — about the implications of purely electronic money services. The writers warn that "government guidance



Scott Bradner

may be needed." The draft gets a bit funny when talking about data privacy. It recommends that consumers be told which personal information is being compiled about them and recommends they be allowed to limit the use of that information. Both suggestions are good, but the draft also implies that existing European restrictions designed to ensure personal data privacy get in the way of commerce and should be removed. In a crunch, sacrifice the individual's right to privacy on the altar of commerce.

The draft is schizoid when addressing encryption. It states that good encryption is vital to good commerce and to protecting the net, but then it goes on to espouse restrictions on the export of technology already widely available outside the U.S.

Finally, the draft is sad, even pathetic, as it credits the growth of the 'Net to the IETF procedure of test before standardization. But it doesn't mention the actual IETF, limiting itself to the traditional standards bodies that have had almost nothing to do with the Internet's success.

This draft is a good start, although littered with myopia on encryption policy, misjudgments on the relative value of personal privacy and corporate revenue, and antipathy for the IETF. Get rid of some of that trash and this road could look good. And, as the draft puts it, "if governments act appropriately, this opportunity can be realized for the benefit of all people."

Disclaimer: I did not consult anyone at the Harvard Business School (molders of commerce molders), so the above must be my opinions.

Bradner is a consultant with Harvard University's Office of Information Technology. He can be reached via the Internet at [sob@harvard.edu](mailto:sob@harvard.edu).

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## AGENDA

### 8:45-11:50 MORNING SESSIONS

- Introduction
- Capturing the Top 10 IT Growth Opportunities  
*Frank Gens, Senior Vice President, Research*
- Will the Telcos Own the Internet? IT Opportunities and Impact  
*Gigi Wang, Senior Vice President, Communications Industry Research*
- Outlook for New Internet Technologies  
*John Gantz, Senior Vice President, Personal Systems and Services Research*
- Software Economics Beyond Microsoft: What Works?  
*Tony Picardi, Group Vice President, Software Research*

Session A 1:15 - 2:00	Session B 2:15 - 3:00	Session C 3:15 - 4:00
<b>TRACK 1: Internet Hot Spots</b>		
Internet Technologies: Opportunities & Challenges <i>Ted Julien</i>	Java's Race to Overtake HTML <i>Evan Quinn</i>	New Media: Is It Ready for Prime Time? <i>Bill Ablondi</i>
<b>TRACK 2: PCs for the Next Millennium</b>		
Plugging in the Toaster: IDC's Outlook on the Information Appliance Marketplace <i>Bruce Stephen</i>	The Vibrant World of the PC <i>Eric Lewis</i>	Semiconductor Opportunities: System on a Chip Solutions <i>Mario Morales</i>
<b>TRACK 3: Winning Software Strategies</b>		
The Application-Centered Data Warehouse Emerges: What Partners and Channels Should You Pursue? <i>Henry Morris</i>	Internet Applications...Is Client/Server Dead? <i>Clare Gillan, Michael Sullivan-Trainor</i>	Bill's New Toy: Can Microsoft Cut It in Content? <i>David Card</i>
<b>TRACK 4: NT in the Enterprise</b>		
NT Adoption — How Fast Will It Happen? <i>David P. Vellante</i>	NT Servers and Clients: Building Winning Strategies <i>Jay Bretzmann</i>	NT: Unix Killer or New Market Growth? <i>Dan Kusnetzky</i>
<b>TRACK 5: LAN/WAN Dynamics</b>		
Next-Generation LANs: Treasure...and Target! <i>Mark Leary</i>	Extending the Enterprise: Remote Access, Wide Area Bandwidth, and More <i>Lee W. Doyle</i>	Network Management: Adding Value to the Package <i>Rick Villars</i>
<b>TRACK 6: Market Spotlight</b>		
The Battle for the Home: Global Prospects for New Media Products and Services <i>Richard Zwetckhenbaum</i>	The Year 2000: Tools and Services Industry Gold Rush and the Realities of End-User Projects <i>Tom Oleson</i>	Japan and Asia/Pacific Market Outlook <i>Philippe de Marillac</i>

### 4:05-4:50 Keynote Address

*Dr. Robert M. Metcalfe, Vice President of Technology, IDC*

### 4:50

Cocktail Reception



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# Technology Update

Keeping Up with Network Technologies and Standards

## NUTTER'S NETWORK HELP DESK

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I administer four NetWare 3.12 servers that are connected across the WAN at 56K bit/sec. I want to load and unload NetWare Loadable Modules (NLM) and run applications on these servers at predetermined times without manual intervention. For example, I'd like to automatically run Sbackup on each server at 10 p.m. each weeknight without having to Rconsole in to the servers. I've tried Cheyenne Software, Inc.'s ARCserve, but I find it's too much of a memory and resource hog. Can you recommend any server-based scheduling software?

Michael Hall, U.S. Probation Office, District of Kansas

Knozzall Systems, Inc. in Chandler, Ariz., offers several good packages: NLMAuto, NLMerlin and NLAuto Professional. NLMAuto provides basic, no-frills NLM loading and unloading. The other packages offer additional options, such as spinning off jobs to workstations. You can reach the company by phone at (602) 545-0006 or via its Web site at [www.knozzall.com](http://www.knozzall.com).

While you're considering these options, you also should think about changing your use of Sbackup because the program is deficient in several areas. My main concern with Sbackup is that it does not allow compare passes. You have no way of knowing if your backup is good without restoring and testing it.

You don't mention what version of ARCserve you have tried, but if you haven't already, I recommend going with 4.02 because it has the smallest memory overhead and can back up the server with a compare pass. You could use one of the Knozzall products to release resources during the day when you don't need to have ARCserve loaded. Any one of the Knozzall packages also would enable you to consider remote rebooting of the servers on a periodic basis to help defragment the multiple memory pools that are a part of the NetWare 3.12 operating system.

## Packet bursting helps Ethernet scale to gigabit-per-second speeds

By Moti Weizman

The fastest way to define a shared-media Gigabit Ethernet standard would be to scale the well-known, carrier-sense multiple access with collision detection (CSMA/CD) algorithm to run 10 times faster, in exactly the same way as Fast Ethernet relies on the 10M bit/sec media access control and repeater. But it's not so simple.

Scaling CSMA/CD would result in a network with an unacceptable maximum diameter of a few meters. This is because the algorithm requires the worst-case round-trip delay of the network to be less than or equal to the transmission time of the shortest legal frame.

For 10M and 100M bit/sec Ethernet, the minimum frame size is 64 bytes. Because the time it takes to transmit a 64-byte frame at gigabit speed is one-tenth the time it takes at 100M bit/sec, the maximum network diameter shrinks to 20 meters. This size is even smaller when delays in repeaters and other active components are considered. These delays cannot be scaled down to one-tenth of the delays in a 100M bit/sec repeater with today's technology.

Sun Microsystems, Inc. has suggested the carrier extension scheme as a simple way to extend the network diameter back to 200 meters, while retaining CSMA/CD values. Sun proposes to increase the minimum frame transmission length from 64 to 512 bytes, and to transmit frames that are shorter than that minimum in a 512-byte window for correct sensing of a collision. The carrier extension symbol is attached to frames that are less than 512 bytes and fills the remaining time in the 512-byte slot.

Carrier extension is simple and straightforward, but there are some potential problems. Obviously, transmitting carrier extension signals instead of real data will result in a low utilization for short frames. For example, a 64-byte frame will have 448 bytes

of wasted (nondata) carrier extension symbols attached to it.

In addition, carrier extension increases the probability of a collision. This effect will amplify some of the CSMA/CD deficiencies such as the capture effect, frame loss, variable delay and unfairness.

The impact of this on the network depends on traffic. But for certain, the gigabit network will not provide the expected tenfold increase in performance over

512-byte collision window, applying carrier extension only to the first frame in the burst. This will effectively average the wasted time (in carrier extension symbols) over the few frames that are transmitted.

If a station has one or more frames to transmit, it will transmit the first frame as if packet bursting does not exist. That is, it will extend the frame if shorter than 512 bytes, and retransmit

it in a properly designed network. The size of the burst varies, but the maximum burst length is 3,017 bytes.




Packet bursting averages the carrier extension symbols over several frames as opposed to just one frame, so it improves the utilization when short frames are transmitted. Network utilization for pure 64-byte frames, for instance, improves from 10% to almost 40%, or from two to eight times the Fast Ethernet bandwidth.

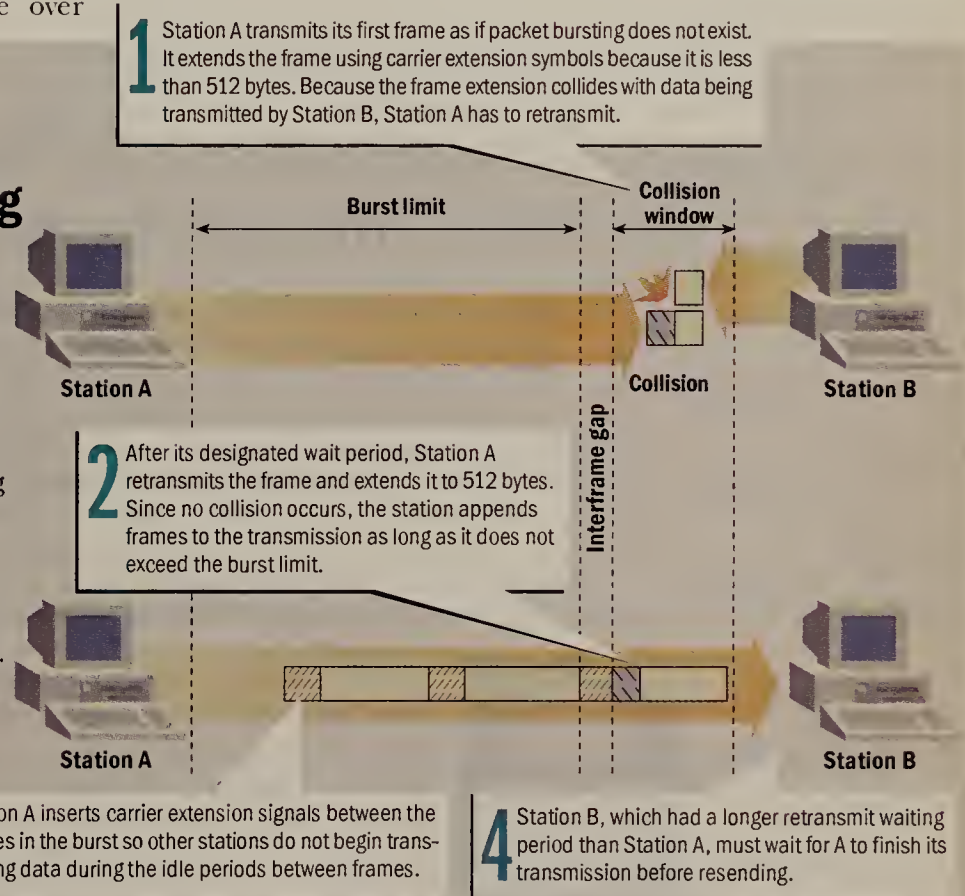
Packet bursting reduces the likelihood of collisions because the burst of frames may collide only during the first frame.

Trying to evaluate the actual

### UP CLOSE Packet bursting breakdown

In order to handle networking at gigabit speeds, the CSMA/CD algorithm used for Ethernet transmissions has been enhanced with carrier extension and packet bursting technologies. The former extends the legal size of an Ethernet frame to 512 bytes and the latter addresses the performance issues of doing so.

-  Data frame
-  Frame extension with carrier extension symbols
-  Interframe gap with carrier extension symbols



Fast Ethernet because it will be unable to operate at the same percentage levels of traffic as its predecessor.

#### A burst of Ethernet

Another scheme, called packet bursting, improves bandwidth utilization for short frames and decreases the probability of a collision in a heavily loaded, carrier-extended network. The concept, developed by NBase Communications and adopted by the IEEE 802.3z committee, is an addition to carrier extension.

The idea is to transmit a burst of frames every time the first frame has successfully passed the

the frame if a collision occurs during the collision window. However, if the first transmission is successful, the station may append unextended frames to it as long as the burst transmission does not exceed the burst limit of 1,500 bytes.

Carrier extension signals will be inserted between the frames in the burst to inhibit other stations from beginning a transmission during the burst.

Essentially, the first frame clears the channel for the whole burst. If the first frame has been transmitted successfully, the remainder of the frames in the burst are guaranteed not to col-

improvement is difficult and depends on the traffic patterns. Packet bursting will be more efficient for a traffic mix of short frames.

However, since short packets are part of every network, frame loss should start at a higher network load under the packet bursting scheme, creating an overall higher throughput on the network.

Weizman is director of hardware engineering at NBase Communications in Chatsworth, Calif. He can be reached at (818) 773-0900, Ext. 244, or via E-mail at [motiw@nbase.com](mailto:motiw@nbase.com).





## Switching put under the microscope at ComNet '97

**I**n the blueprints, everything is possible. But, as *Network World's* Switching Showdown at last week's ComNet '97 proved, the move to switched networks looks a whole lot more complicated once you peel off the shiny veneer of marketing.

The Showdown pitted the top technical executives from the four largest internetworking companies against each other in a debate aimed at ferreting out the strengths and weaknesses of their strategies for bringing your shared LAN environments into the world of switching.

Now, no 75-minute event can address all the issues involved in that migration. But the Showdown made clear that, while the vendors may use the same buzzwords and show the same endpoints on the switching map, they are approaching the problem from different starting points.

In short, you really need to understand what standards, technologies and management schemes the vendors endorse before committing to any of their strategies. Detailed questions from the panelists at the Showdown drew out some of the issues you need to explore. For example:

- In order to deliver key features in its architecture, 3Com Corp. wants you to swap in new network interface cards (NIC), which may complicate your upgrade and hike your costs. (It's hardly surprising, though, for a company that derives a big chunk of revenue from NICs.)

- Bay Networks, Inc. faced questions about what some perceived as inconsistent statements on the role of virtual LANs, which play a big part in Bay's plans. Are VLANs only for small workgroups, or will they be able to scale up? How will they work over WANs? Bay's strategy bears close examination if you don't buy into the concept of VLANs.

- Cabletron Systems, Inc. drew praise for the simplicity of its switching architecture but questions about whether that simplicity comes at the cost of openness. You'll need to examine the architecture to determine whether it is proprietary or open by your standards.

- Not surprisingly, Cisco Systems, Inc. was hit with questions about integrating the many technologies it has acquired into a coherent switching architecture. The company is also touting a variety of schemes — from Tag Switching to NetFlow to Multi-Protocol over ATM support — to resolve key switching issues. You'll need to examine how well all of these things will mesh and how complicated they'll make your life.

Because these executives were willing to stick their necks out in public, the Showdown was a success. It shed light on a confusing area and gave customers greater insight into the plans of the major players.

Now, on to the next Showdown. I'd like to stage future events examining remote access, and server and directory strategies, among others. What would you like to see?

*John Gallant, editor in chief*

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*Java Break • Ted M. Young*

## Java Framework Wars have only just begun

**B**ack in the early '90s, when C++ started to become popular for Windows development, it was a two-way battle between Borland International, Inc. and Microsoft Corp., with Borland's C++ product being the more popular. Borland and Microsoft had their own application frameworks — the Object Windows Library (OWL) and the Microsoft Foundation Classes (MFC), respectively.

Today, if you're doing any Windows development in C++, you're likely to be using MFC. Even Borland supports compiling MFC programs, though it continues to update OWL.

Now we have the sequel to the C++ Framework Wars — the Java Framework Wars.

In December, Netscape Communications Corp. released its framework, the Internet Foundation Classes (IFC). Symantec Corp. and Asymetrix Corp. support IFC in their Java development environments, Café and Super-Cede Java Edition, respectively. If you visit Netscape's IFC Web page (<http://developer.netscape.com/library/ifc/index.html>), you can see applets and applications using IFC as a platform for Java development.

Last month, two more contestants entered the fray.

First, Microsoft announced its Application Foundation Classes (AFC), a "set of cross-platform class libraries for Java." The company hasn't released the API details, let alone code. However, due to the experience Microsoft has gained in designing the MFC, I expect the API and code will be of high quality.

Then, late last month, Marimba, Inc. released Bongo, which is more than just a graphical user interface (GUI) framework; it's also a GUI builder with ease-of-use similar to that of Microsoft's Visual Basic.

You may wonder where JavaSoft stands in all this. After all, JavaSoft supposedly controls the direction of Java.

Well, JavaSoft is in a difficult position. Its products need to remain backward compatible with the Abstract Windowing Toolkit, and in the forthcoming Java Development Kit Version 1.1, JavaSoft has been able to move forward without breaking existing code. JavaSoft doesn't have the luxury of coming out with a totally new framework and declaring it a new standard, so the company has taken the tack of supporting any framework that's "100% Pure Java," such as Net-

scape's IFC. However, the IFC will not become part of the Java core libraries that must ship with all Java implementations.

With the overhead for these frameworks under Windows 95/NT ranging from 610K bytes for Bongo to 1,320K bytes for IFC (no information is currently available about the size of AFC), they won't really be useful for Web-based applets until the frameworks are distributed as part of the browser. This is something Netscape and Microsoft plan to do in their 4.0 browser releases.

Bongo is at a disadvantage because it appears that even though Marimba's Castanet Tuner functionality will be supported in Netscape's Constellation product, the Bongo GUI framework will not. This means users will have to download 610K bytes worth of classes to run Bongo-based applets.

Previously, there was no reason to force users to choose Microsoft's browser over Netscape's (or vice versa) for Java applets. But now developers have to make a choice: Use the AFC and be tied to Microsoft, use the IFC and be tied to Netscape, or use neither and lose out on much-needed functionality such as layering of components and transparency. The decision is easier for applications: Use the better framework, which for now is the IFC, mainly because it's supported in development tools. However, final judgment awaits the release of the AFC.

In any case, get accustomed to using Java frameworks, but don't bet the company on one particular product yet. This sequel has just begun.

*Young is president of Advanced Web Technologies Corp., a Java training, consulting and outsourcing firm in New York. He can be reached at (212) 487-9064 or via the Internet at [tyoung@javatrain.com](mailto:tyoung@javatrain.com).*



Send letters to [nwnews@nww.com](mailto:nwnews@nww.com) or John Gallant, editor in chief, Network World, 161 Worcester Road, Framingham, MA 01701. Please include phone number and address for verification.

### Target big pirates

Regarding Mark Gibbs' column on software cracks and their propagation via the Internet (Jan. 6, page 46):

The real money lost on piracy is in places like China and Hong Kong, which permit the mass production of cheap CDs containing complete commercial programs.

Take aim at these large-scale pirates, not the individuals who distribute a few cracks and some bad English.

*Robert Bourne  
Network manager  
DMB&B  
Los Angeles*





## ATM has more than an image problem

**F**all a few billion dollars short of forecasts and everybody loses respect for you. That's been the fate of ATM recently. Driven by hype from the press and analysts, vendors scaled revenue expectations to the skies and watched as they went unrealized. Now vendors are doing spin control and, ironically, are digging themselves into deeper trouble with buyers. The result could be not only an image problem for ATM, but a feature problem, as well.

The problem starts with potential buyers' incredible dependence on the news media. When ATM was hot in the press, vendors could be assured it would be in the public eye and, therefore, users looking to buy network equipment and services would consider it.

In fact, ATM has been deployed successfully in many places, but not in as many as pundits had predicted. Thus, ATM is viewed as having failed, and the press has shifted from uncritical praise to unreasonable criticism.

Vendors, responding to the bad PR that ATM now generates, are looking for other ways to get their products into the press. Some, such as Whitetree, Inc. and FORE Systems, Inc., have respun their stories to focus on LAN switching in general rather than ATM in particular.

This tactic exaggerates the bad press by creating an impression of mass defections from the ATM vendor ranks. A more serious problem, however, is the growing trend to put ATM features into pre-ATM products to spare these features from the dampening effect of ATM's public relations problem.

For example, Cascade Communications Corp. recently announced Priority Frame, a quality-of-service (QoS) enhancement for frame relay networks modeled on the QoS specifications for ATM. This kind of feature shifting permanently undermines the value of ATM by raising the capabilities of pre-ATM technologies to the point where ATM's remaining benefits can't justify its incremental cost. If ATM costs a megabuck and frame relay with ATM QoS costs half that, why go the rest of the way for those few applications that frame relay QoS can't support?

FORE and the Newbridge Networks, Inc./Siemens Stromberg-Carlson alliance have separately announced initiatives targeting ATM switching at the infrastructure market — the part of the public network that's buried so deep in central offices and Bell-head technicians that no user even gets a hint of its existence.

This represents at least a partial abandonment of the idea that ATM is justified by new applications in favor of the idea that it's a better way to shuffle bits. Whether ATM could hope to emerge alive from a burial in the bowels of the carrier network is

a big question.

There are other challenges to ATM in the applications space. The plethora of switched Level 3 strategies, such as Ipsilon Networks, Inc.'s IP switching and Cisco Systems, Inc.'s Tag Switching, are targeted at providing IP transport that is far faster and more stable than normal connectionless routing.

This might well make it possible to support multimedia over IP nets of quality levels so close to ATM quality levels that any further improvement wouldn't be worth the additional cost of ATM adapters and software.

We saw something like this in the late 1980s with ISDN. Caller ID, touted as one of the great benefits of ISDN, was viewed as a benefit so great the market couldn't wait for ISDN to get it. The result was a slower deployment of ISDN and a shifting of its perceived value from the general telephony space (where caller ID was a primary issue) to the data space — where ISDN is now happily eating up the capacity of central office switches through long connect times for data calls.

The Great ATM Feature Shuffle begs the question of whether ATM can now hope to be widely deployed at all. Certainly the optimism of the early 1990s was misplaced, but it's interesting that all the vendors mentioned here still assert a strong belief in the essential value of ATM. Are they just shucking and jiving?

The fact is, we don't know. One price of a market driven by hype is that the public eventually loses faith in all its information sources.

According to surveys my organization conducted late last year, less than half of today's buyers believe any source of information — from vendors to the press — offers truly compelling market information.

Every ATM prospect or buyer we surveyed believed their vendors misrepresented something.

We're now playing out a lot of little ATM-like scenarios with new technologies, such as the Resource Reservation Protocol, LAN switching, IP Multicast and Gigabit Ethernet. In each of these cases, early expectations are insanely high, promising a precipitous fall from market grace as reality sets in. If the cycle of boom and bust crippled ISDN and is crippling ATM, can the real value at the core of each of these technologies be spared?

Let's hope so. A 21st century built on analog modems is going to be really boring.

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### Apple's to-do list

I believe Apple Computer, Inc. will survive these tough times. However, it will not do so solely on the strength of its new operating system (Jan. 13, page 8). Apple must take several other steps to ensure its future in the marketplace.

First, until Apple has a modern operating system on the market, which will take at least another year, the company should leverage other modern operating systems, such as Windows NT, to keep its hardware platform alive. To do so, Apple and clone makers must produce PowerPC Reference Platform-compliant Macs immediately.

Second, Apple and clone makers must get the high-powered X704 (533-MHz) Exponential Technology CPU to market as soon as possible — preferably in PowerPC Reference Platform-compliant machines. If vendors can do this, they will produce the

fastest and most flexible PCs on the market.

Third, Apple should continue aggressively licensing to clone makers and reduce the number of models in its line. Apple needs to focus more on producing software and designing hardware, and let the clone makers build the hardware.

Fourth, Apple needs to build net management tools into the operating system. With Open Transport, the Macs make decent net clients. However, the remote management software needed to manage Macs in large LAN/WAN environments is virtually nonexistent.

The most encouraging news I've read about Apple lately is that Microsoft Corp. has formed an 80-programmer Macintosh division to produce Office97 and other applications. If Microsoft is finally making a sizable investment in producing Mac products, Microsoft must believe

Apple has a future. If Microsoft believes it, so do I.

*Loren Roseman  
Principal consultant  
Knowledge NETWORK Systems, Inc.  
Skokie, Ill.*

### AOL's not alone

The press has been full of articles and editorials regarding America Online's problems with oversubscribing its service. Another service that bears looking into is Sprint Corp.'s Sprintsites.

In Northwest Florida, Sprint did a mailing blitz in mid-December offering a free 30-day trial. I bit. Service was good for about three weeks. Now the local dial-in phone number returns more busy signals than connects. When you get past the local router, you are often stopped dead because the Web site won't process your logon information. If you get logged on, forget about connecting with a URL.

Instead, you are told Sprint site is experiencing "logic errors."

The whole AOL/Sprint thing stinks about as bad as trying to get tech support for buggy, released-too-soon soft-

ware or hardware!  
*Bob Bassett  
Network manager  
Okaloosa-Walton  
Community College  
Niceville, Fla.*

### Teletoons





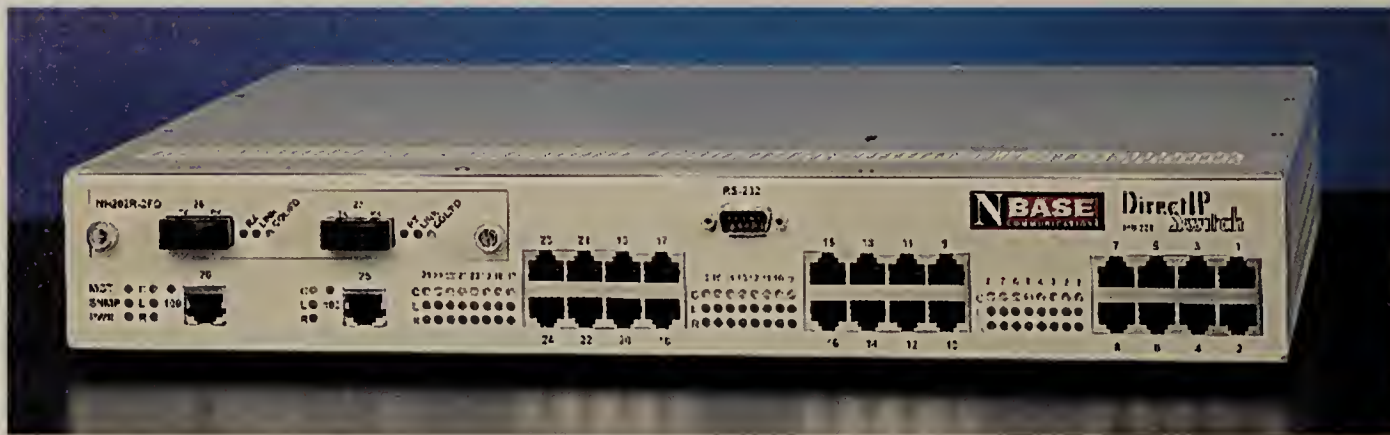
# DirectIP™ Switching

## Bringing The Switching Revolution To The World Of Routing

### Why is DirectIP™ Switching required?

The explosion of Internet and Intranet applications, combined with the growing number of IP hosts, have increased IP traffic beyond the capabilities of routers. A Router needs to examine every single packet of information to determine where to send it, leading to a high level of complexity and low performance.

And, because all traffic between different IP subnets passes through the router, it creates a bottleneck.



### What is DirectIP™ Switching ?

The NBase DirectIP™ switch examines only the first packet in a stream of data and performs security checks to authenticate the connection. Once the connection is allowed, the entire stream will be forwarded to the destination through the switching fabric. By transforming the entire

switched network into a huge IP switch, data can be sent much faster than through a router.

**DirectIP™ by NBase is the only IP switching solution specifically engineered for the high performance needs of LAN infrastructure.**

### What benefits will DirectIP™ switching provide to your network?

- Wire speed IP forwarding, significantly improving network performance
- Scalability to any switching speed, supporting future network upgrades
- A high level of security options for limiting access to sensitive resources
- Lower installation and maintenance costs
- Redundancy options for mission critical networks

### Why is DirectIP™ the best IP switching solution?

- DirectIP™ switching is based only on existing standards
- DirectIP™ works with any network adapter, without requiring manual configuration
- A DirectIP™ Switch will even work with your existing switches, providing the full benefits of IP switching to a multi-vendor network
- DirectIP™ switching is not limited to any protocol and can be implemented with any LAN topology

To learn more about this revolutionary technology  
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# DARK SIDE

**By Thomas Nolle**

**BRIAN RASZKA**

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switch. Thus, ATM switches often provide large buffers. With LAN switches, particularly those at the workgroup level, the virtual media can be made fast enough to reduce or eliminate the risk of congestion. LAN switches often have much smaller buffers and largely ignore traffic management issues.

What happens when switches not designed for buffering and traffic management run into resource congestion? You may be surprised to find out that your switched network, under some conditions, will run more slowly — or not at all.

#### Exit port collision

Think back to the description of switch operation. Input items from one station or port are switched to the destination based on either the MAC layer address (in LAN switching) or the ATM Virtual Channel/Virtual Path indicator (in ATM switching). If the switch can keep up with the combination of ports it supports, everything is fine, right? That was the assumption you were asked to remember.

It may be a bad one. There is also a question of whether the destination or exit port on the switch can keep up. In fact, it is the possibility that traffic can collide at the exit port that makes limited-speed carrier trunks a problem. If we have 20M bit/sec of traffic directed to a 10M bit/sec port, not all of it will be carried. In switches with a lot of port buffering, the excess will be held in the hope that the burst of traffic will subside and all the data can still be delivered. If the amount of buffering is small or the amount of colliding data is large, the switch will have to discard information.

Hey, so what? Shared-media Ethernet LANs have collisions all the time and nobody gets upset. ATM networks are known to discard cells and nobody gets upset. Why should discarding due to exit port collision be bad?

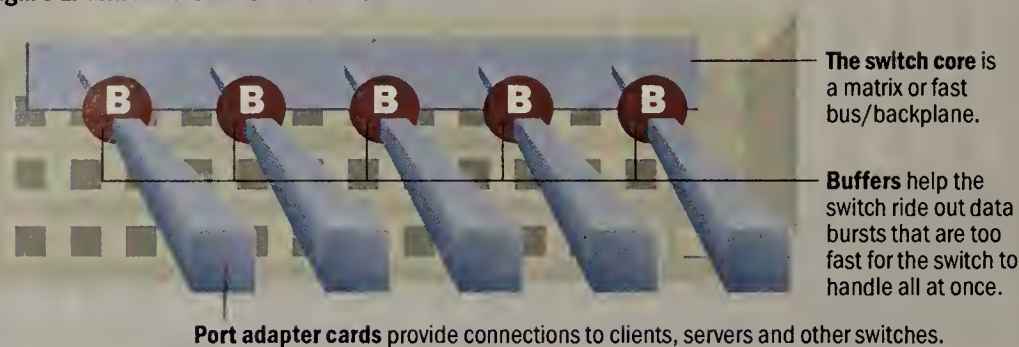
The reason is simple: In shared-media Ethernet LANs, when two stations collide in their attempt to transmit information, each will sense the collision. That's what the CD in CSMA/CD stands for — collision detection. The stations will back off a random number of microseconds and then retry. The randomness of the back-off period for each will make it unlikely their second attempts will collide. But with most LAN switches, the sender's port adapter has already accepted the message by the time the exit collision occurs. The sending station goes happily about its business of preparing the next message, but the first message collides with other traffic at the destination switch port and is discarded (see Figure 2).

That doesn't mean the data is lost, though. If the exit port adapter drops a message, the higher level protocol — if there is one — will recover it. TCP/IP will work in such a situation because TCP will detect the loss and retransmit after a significant delay. Datagram protocols such as those used for voice or video typically don't provide end-to-end error recovery. For those protocols, the data discarded at the exit port is lost forever.

ever. Worse yet, many protocols (such as TCP) will reset the flow control window size to the minimum value to prevent further discards.

Exit port collision isn't all that unlikely

Figure 1: THE ANATOMY OF A SWITCH



either. It typically occurs on server trunks and on switch-to-switch trunks. The slower the exit trunk, the more likely exit port collision because the chances are that a slow trunk will be tied up when new data arrives. In both cases, shared destination ports are just like a shared-media LAN, which is ironic because that's what switching is supposed to be eliminating.

How bad does this get? One switched LAN study CIMI Corp. did for an end user showed that eight active switched source ports running client/server application software could so overload a switch-to-switch trunk port that the effective throughput of the connection fell from 100M to 18M bit/sec. A similar degradation was reported to CIMI by a LAN switch value-added reseller (VAR).

So is the answer ATM? No, because ATM in many of its current implementations has the same problem. ATM LAN emulation (LANE) and Multi-Protocol over ATM (MPOA) today rely on an ATM class of service called unspecified bit rate (UBR). With UBR service, the sender does not provide any description of the traffic flow that will

be generated, and the network doesn't make any resource reservations to carry it, police it or limit traffic at the source. Information flows into the switch at the rate the sender port can support. When multiple flows converge on the same exit port (at the same speed or slower), traffic collides at random — as a connectionless LAN flow would collide — and is discarded as readily.

CIMI talked to the user of a popular ATM switch who had that problem when connecting two switches over a campus T-3 link. The client and server systems were running at 155M bit/sec, and the exit port collision at the T-3

trunk was so severe that the applications timed out and failed.

#### What can be done?

If exit port collision can ruin your application, what can you do to prevent it? There are two basic answers to the problem, each represented by some specific vendor implementations. You need to be sure what (if any) approach your vendor uses and what the ramifications of each are for performance.

The first approach is buffering. If a switch has sufficient buffers to ride out a period of collision, overall switch delay will increase (because of the buffering delay), but no data will be discarded. The question here

is just what constitutes sufficient buffers. Without any mechanism for constraining the senders of information, a long burst will eventually overflow any buffer if the combined data targeted to the port arrives more quickly than the port can send.

ATM switches tend to use buffering as their solution to the problem, but as the example of the VAR showed, multiple flows of UBR ATM originating in fast ports can even overflow ATM buffers. Where buffers are part of a central pool, it may be impossible to target available buffer capacity for specific congested output ports. And remember, no matter how big buffers are, it's still possible to overflow them if you can't shut up the senders.

The second strategy is to link switching and exit port processing so the sender of a message "sees" competition for the destination's port while data is still flowing. This allows the sender's port to create a kind of virtual collision at the MAC layer that forces the sender to back off and retry. In other words, this feature mimics the collision detection feature of shared-media LANs. Obviously, this approach works only with collision-detection MAC layers such as Ethernet. With token ring or FDDI, MAC layer flow control is unavailable.

To make flow control work, the switch must sense that the output port is busy when a data message arrives and must generate a false collision to stop the sender from continuing to provide data. This is usually done based on buffer levels; Madge Networks, Inc. and 3Com Corp. offer this type of flow management on at least some of their products.

ATM promises per-station flow control through the available bit rate (ABR) class of service, but ABR isn't fully deployed yet, and most switch vendors offer it only on ATM-equipped desktops. Traffic originating at legacy adapters and entering an ATM switch using LANE or MPOA don't use ABR. Some within the ATM Forum have been promoting a change to the LANE and MPOA standards to allow ABR as well as UBR connections.

Some ATM vendors, including IBM, pro-

vide some traffic shaping and resource allocation even for LANE/UBR users. Most vendors will eventually adopt ABR as an option for LANE and MPOA when, and if the standards provide for it. If you're planning to use ATM on the premises, find out how your prospective vendors handle this before you make the final selection.

Even if your switch vendor has one or both of these features, you may need to quantify how their solution will help you. Benchmark tests may provide a hint. Look for tests where six or more input ports are used to drive a single output port. The more input ports, the better the test will mimic real multiclient server or switch trunk performance.

Performing the tests yourself is also possible, provided you have a LAN analyzer and can generate enough traffic to overload the server or switch-to-switch trunk.

What if none of the vendors you like can eliminate exit port collision? For all switch types, there is a third approach buyers should seriously consider, making the exit port much faster than the source ports that will feed it data. This will reduce collisions

to the point where they can be ignored. Even for LAN switches that gracefully handle exit port collision through buffering or flow control, faster shared ports/trunks will reduce switch delay and increase application performance.

Before you turn up your nose at this brute-force strategy, you should note that it's the one most vendors recommend. Even buyers and resellers report that when 10M bit/sec Ethernet client systems are used with 100M bit/sec server or switch

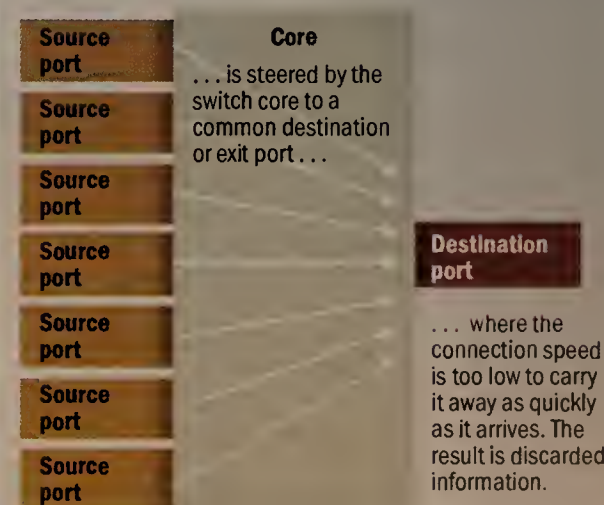
trunks, collisions are so rare that they can be ignored in most applications.

Resellers, in particular, like this kind of configuration because it reduces support problems, and they are recommending the configuration in increasing numbers. That would suggest that the biggest benefit of Gigabit Ethernet is its ability to oversup-

*One switched LAN study showed that eight active switched source ports could so overload a switch-to-switch trunk port that the effective throughput would fall from 100M to 18M bit/sec.*

Figure 2: EXIT PORT COLLISION

Traffic from multiple active sources . . .



ply these logical shared ports with bandwidth to prevent collision and performance loss, even when 100M bit/sec clients are in use.

How much oversupply is needed? Testing

See Switching, page 39



# Video on a shoestring

*Four low-cost, software-based desktop videoconferencing packages that will give you the basics – at least.*

By Stuart Melnitsky

**R**emember when videoconferencing meant gigantic systems that cost thousands of dollars, special rooms users had to fight to reserve and massive amounts of costly wide-area bandwidth? If you do — or even if you don't — you'll really appreciate the current crop of software-based desktop conferencing systems.

These low-end packages consist only of software running on client PCs along with a camera and sound card. In some instances, you may need a video capture board and, for multipoint conferences, a separate PC to control things. But the cost has come crashing down to earth — in the neighborhood of \$300 for everything you need to outfit a client PC for a videoconference of respectable quality.

We rounded up four low-end, inexpen-

sive software-based desktop packages that provide basic functionality via LAN, ISDN and serial modem connections. If you have a few pockets of users who need or demand videoconferencing, any one of these products — Connectix Corp.'s VideoPhone, Specom Technologies Corp.'s Internet VideoPhone, VDOnet Corp.'s VDOPhone, and White Pine Software, Inc.'s CU-SeeMe — can do the job.

Sporting a well-designed user interface and boasting the best-quality video of the bunch, White Pine's CU-SeeMe emerged as the winner. It's the only package in this group that supports multipoint videoconferencing among three or more participants, albeit with additional software and hardware.

Aside from multiparty conferencing, VDOnet's VDOPhone and Connectix's VideoPhone match up pretty well in most areas. They support point-to-point conferences, as well as broadcasts — also known

as multicasts — which can prove useful for giving business presentations when it's too difficult to gather employees in a conference room or an auditorium. (Note: At the time of our testing, Connectix's VideoPhone Version 2.0, a 32-bit version of its software, was in beta test. It may be generally available by the time you read this.)

Specom's IVP, on the other hand, registered the lowest score in our testing. It offers basic point-to-point conferencing, but not much more. The quality of the video, while acceptable, fell short of that offered by the other packages. There is also no support for broadcasts, and users cannot screen or block incoming calls.

All the products provide acceptable video quality, as long as they're not competing for bandwidth on a congested network. Under the best of circumstances — a 10Base-T Ethernet network with no competing traffic — most of these products provided adequate full-motion video.

For instance, VideoPhone, when used with Intel Corp.'s ProShare cameras and video capture boards, generated video streams that reached 20 frame/sec at a 320 by 240 resolution. That translates into a pretty good image size with no noticeable latency for typical videoconferencing sessions.

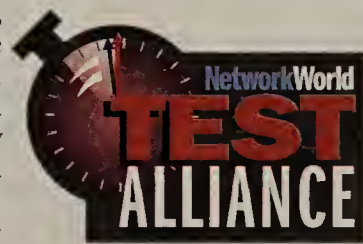
However, none of these packages can consistently transmit rapid movements, such as flailing arms or quick nods of the head. If you want to speed transmission, you can go with lower resolution — 160 by 120, for instance — though the small window size can

be distracting and can undermine the purpose of videoconferencing.

And when we used these packages with Connectix QuickCam digital cameras, performance suffered a bit. At the low end, Internet VideoPhone hit 4 frame/sec — at that speed, images appeared more like a rapid succession of still frames than full-motion video. Still, it was bearable. Using the Connectix QuickCam, CU-SeeMe hit the high mark of 10

frame/sec, transmitting pretty fluid images, as long as subjects did not move too quickly. When not used with 28.8K bit/sec modems, motion became jerky-jerky and the audio was not even close to synchronized — distractions that will likely overshadow any benefit.

There were other shortcomings. Each product lacks centralized management tools to monitor and, if necessary, control bandwidth demands. If you're planning a



## CU AROUND

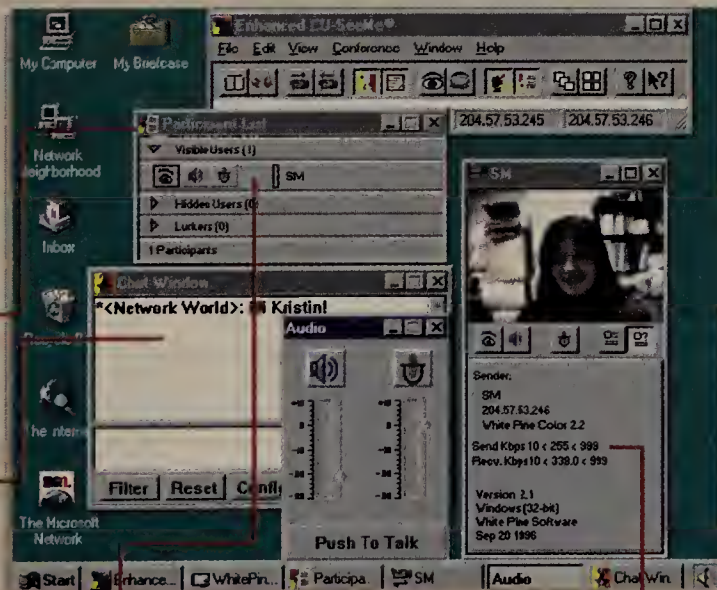
CU-SeeMe topped its competitors in our review, in part for its conferencing feature and easy-to-navigate interface.

1. The Participant List window allows you to see who's participating in your conference while...

2. ...the Chat window lets you type messages to other participants.

3. You can view the name and IP address for an individual conference participant, as well as for...

4. ...video transmission and reception speeds.





large-scale videoconferencing implementation, you'd be better served with a higher end application (see story, page 39).

#### Facts and features

Installation and setup is a snap, but you'll need to decide what kind of camera to use. You have two choices: a digital camera that connects to a client's parallel port or a higher end camera that requires a video capture board. Digital cameras such as the QuickCam are pretty inexpensive, but they rely on the client PC's processing power for video compression. If your clients' processors are busy churning other applications, you can opt for a camera that works with a video capture board, which handles much of the video compression.

We tested each package with a variety of cameras: Connectix's QuickCams; VideoLabs, Inc.'s FlexCam with a Stinger video capture board, which VideoLabs packages with the FlexCam; and Intel Corp.'s ProShare camera and video capture board. We performed some additional cross-testing and found that all combinations worked, with the sole exception of the VDOPhone-Intel tandem.

You'll also need sound cards in your client PCs. Full-duplex cards will allow you to talk and listen at the same time. If you have a half-duplex card, you can speak or listen but you can't do both at the same time, which isn't necessarily bad, although it can present problems if one party monopolizes the conversation.

All of these packages allow users to establish videoconferencing sessions over TCP/IP, which means you'll need the TCP/IP address of any client with which you want to conference. On a corporate net, client machines typically have static addresses, which you can save in a phone book. However, each time you connect to an Internet service provider, your client is dynamically assigned a different IP address — there's no way to know it ahead of time. So you and your conferencing partners will have to take note of your dynamically assigned IP addresses at the beginning of each session in order to establish a connection. Effectively, that means you'll have to place a traditional phone call or send an E-mail message to trade IP addresses and get things rolling.

Included in the CU-SeeMe package is Four11 Corp.'s Four11, an application that allows you to register your IP address in a Web-based directory, allowing CU-SeeMe users outside of your organization to look up your address and initiate direct videoconferencing connections. Connectix also allows VideoPhone users to register with Four11, while VDOPhone offers its own registry.

Each package also supports ISDN and 28.8K bit/sec or higher modem connections. VDOPhone also supports H.324 modems, if you plan to conduct conferences via synchronous modems.

If you're looking for NetWare/IPX support, you'll want to take a closer look at VideoPhone — it's the only one that supports IPX.

Each package offers an easy-to-follow interface, but we preferred VDOPhone's minimalist approach. It presents a box for the remote video image; sliding controls for playback volume and video quality (quality vs. motion); a single drop-down menu of user options; a button for setup

parameters; and a call button for placing calls. CU-SeeMe and Connectix's VideoPhone rely on more traditional toolbars and menus, but are fairly straightforward. Though the interface on Specom's IVP is easy enough to follow, the screen layout lacks flexibility in terms of the size and number of windows shown — you're stuck with local and remote video windows, plus a whiteboard window, whether you need it or not.

#### Is anyone listening?

Each package offers essential user features such as address books, snapshot capabilities, image import/export, and recognition of symbolic IP addresses. However, some differences are worth pointing out.

As noted earlier, CU-SeeMe is the only one of these packages that supports multiparty conferencing, although it requires White Pine's Reflector software to be installed on another Windows or Unix system with an IP address. Conferencees then

detected. IVP and VDOPhone, on the other hand, must be running in order to receive calls.

Then there's the issue of how to deal with those incoming calls. Specom's IVP gives users no discretion. If you are running IVP and receive a call from another user, you are automatically connected, though you or the other party still has to choose the videoconference option from the video menu.

When one party initiates the videoconference, the other party has no way to block or screen the videoconferencing request other than exiting the IVP program.

CU-SeeMe, VDOPhone and VideoPhone,

import documents from other applications for viewing and annotating. CU-SeeMe's whiteboard, dubbed WhitePineBoard, is also pretty functional. Specom's whiteboard, TeleBoard, will do the trick for most, though it offers a comparatively limited set of tools for drawing and annotating. Still, it beats out VDOPhone, which has no whiteboard capability.

#### Increase the bandwidth

As you try to contend with the network ramifications of these desktop videoconferencing systems, be aware that some packages allow users to modify bandwidth



## ScoreCard

	VideoPhone	IVP	VDOPhone	CU-SeeMe
<b>Overall score</b>	<b>8.2</b>	<b>7</b>	<b>7.8</b>	<b>8.5</b>
<b>Video compression/quality (25%)</b>	8	7	8	9
<b>Videoconference types (20%)</b>	8	7	8	9
<b>Network/connectivity support (20%)</b>	9	7	7	7
<b>User interface (15%)</b>	8	7	9	8
<b>Client support (10%)</b>	8	7	7	9
<b>Bandwidth/video settings (10%)</b>	8	7	7	9

Scores based on a scale of 1-10. Categories are weighed by the percentages shown.

## NetResults

Product	Connectix VideoPhone 1.1 for Windows	Internet VideoPhone 3.0	VDOPhone 2.0	Enhanced CU-SeeMe 2.1 for Windows
Vendor	Connectix Corp. (800) 950-5880 www.connectix.com	Specom Technologies Corp. (408) 982-1880 www.specom.com	VDOnet Corp. (415) 846-7700 www.vdo.net	White Pine Software, Inc. (603) 886-9050 www.wpine.com
Price	\$49; \$229 for bundle that includes VideoPhone software and Color QuickCam; \$99 for Talkshow whiteboard application	\$70	\$99; \$149 for H.324 version (for POTS)	\$99 for CU-SeeMe; Reflector software starts at \$995 for 10 users
Pros	<ul style="list-style-type: none"> <li>▲ Good quality video with parallel port cameras or video capture boards</li> <li>▲ Robust whiteboard capabilities</li> <li>▲ Can automatically detect incoming calls and launch videoconference</li> <li>▲ Macintosh client available</li> </ul>	<ul style="list-style-type: none"> <li>▲ Whiteboard capability</li> </ul>	<ul style="list-style-type: none"> <li>▲ Well-organized user interface</li> <li>▲ NetAnalyzer window displays useful transmission information</li> <li>▲ Excellent online help</li> </ul>	<ul style="list-style-type: none"> <li>▲ Offers highest speed and best quality video transmission</li> <li>▲ Supports multiparty conferencing via Reflector sites</li> <li>▲ Bundled with Four11 software for registering IP addresses with Four11 Web-based directory service</li> <li>▲ Can detect incoming calls</li> <li>▲ Allows users to change a wide variety of bandwidth and video settings</li> <li>▲ Macintosh client available</li> </ul>
Cons	<ul style="list-style-type: none"> <li>▼ None significant</li> </ul>	<ul style="list-style-type: none"> <li>▼ Poorest quality video</li> <li>▼ No multicast support</li> <li>▼ No call screening</li> <li>▼ Inflexible user interface</li> </ul>	<ul style="list-style-type: none"> <li>▼ Lacks whiteboard</li> <li>▼ No support for Windows 3.1</li> </ul>	<ul style="list-style-type: none"> <li>▼ None significant</li> </ul>

connect to the Reflector site. Security mechanisms allow you to restrict participation by implementing unique conference IDs and passwords. As a participant in a videoconference, you can view a list of all the other participants and determine who gets to see and hear you. You also have the option to set up a one-on-one conference, if you need to take a conversation offline.

CU-SeeMe and VideoPhone also offer "listeners," which are TSRs that automatically alert users and start the videoconferencing application when inbound calls are

in contrast, allow users to screen their calls. When inbound calls are detected, pop-up windows identify the caller and allow users to either accept or reject these calls.

If you're looking for more than just videoconferencing, three of these packages include whiteboard applications that can run in conjunction with a videoconferencing session or independently.

The best of the bunch is TalkShow, which you can get with VideoPhone for an additional \$99 per client. With TalkShow, connected users can draw on blank easels, or

settings. You can set up guidelines for users — and hope they abide by the rules — but you cannot enforce top-down control.

CU-SeeMe allows users to specify minimum and maximum transmission and reception rates. By default, it sets transmit/receive rates at 80K bit/sec. Users can increase these rates up to 999K bit/sec. If you're connected to a modem, you'll likely have to reduce these speeds to match the modem's capabilities. VideoPhone also allows users to set transmission and reception

See Review, page 39



## SWITCHING

Continued from page 36

in this area apparently isn't exhaustive, but interviews with users and resellers indicate that the trunk port should be at least five to six times as fast as the source ports. That ratio may have to increase if many sources are ganging up on a single destination. The each-generation-is-10-times-faster strategy of Ethernet meets this requirement. For ATM, using ATM25 client ports and 155M bit/sec trunks and server connections would work. Faster clients would require 622M bit/sec ATM servers and trunks.

### The simple truth

Switching is a good thing, and we don't want to imply otherwise. But a lot of good things have dark sides, particularly if they're applied without examining the value propo-

sition closely. Fast switching isn't useful with slow trunking, and trunking means any connection that multiple users will compete for — servers and switch trunks alike. If you want to get the most out of your switch investment, you need to be sure that server and switch-to-switch trunks are fast, and that's the simple truth.

If you've got fiber installed in your building, or access to dark fiber from place to place, the benefits of switching can extend as far as you can extend that glass. As soon as you hit a carrier service, though, you may find your bandwidth so limited by cost that

*How much oversupply is needed? The trunk port should be at least five to six times as fast as the source ports. That ratio may have to increase if there are very large numbers of sources ganging up on a single destination.*

switching won't provide any noticeable benefit. Don't throw your routers away, particularly the ones that support your WAN connections. You'll need them until the speed of those WAN connections rises substantially — probably at least to

the OC-3 level.

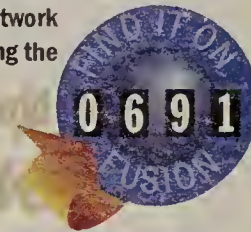
Speed of trunking is the ultimate answer to switch performance. If you can't provide it, be sure your vendor can handle exit port collision gracefully.

Finally, if you're an ATM fan, grill your vendor on the use of ATM ABR service with all forms of LAN-over-ATM connectivity.

If you don't address these points in your switch purchasing, you risk major performance problems now and in the future.

*Nolle is president of CIMI, a technology assessment firm in Voorhees, N.J. He can be reached at (609) 753-0004 or via the Internet at*

**For more info on selecting the LAN switch that's right for you, check out our 1996 Buyer's Guide on the topic as well as a feature on factors besides performance that should play into your decision. Access this data via Network World Fusion by entering the number at right in the DocFinder box on the home page.**



<http://www.nwfusion.com>

## REVIEW

Continued from page 38

tion rates, up to 512K bit/sec for LAN connections.

VDOPhone and IVP don't allow users to manipulate bandwidth settings, though they do provide tools for users to monitor performance. IVP shows the transmission and reception rates during videoconferencing sessions, while VDOPhone offers an event analyzer window, NetAnalyzer, which shows several different transmission/reception statistics, such as bandwidth, audio and video packet loss, and round-trip time.

These packages will, by default, select the appropriate audio and video compression-decompression routines, or codecs, but end users can play around with these settings, just as they can modify camera settings. All

ages can be set up quickly and offer pretty good performance under different network scenarios. But, even under the best of circumstances, some audio and video latency can seep into your videoconferencing sessions.

And, as these applications proliferate on your network, they will place greater

demands on your most precious commodity — bandwidth.

Several of these vendors allow users to download trial copies of the software, so you may want to test the waters before making a commitment.

And, if you're looking to incorporate Macintosh computers into your videocon-

ferencing loop, White Pine and Connectix offer Macintosh client software. But, for the best all-around product in this group, we give the nod to CU-SeeMe.

*Melnitsky is an independent networking consultant and analyst in Arlington, Mass. He can be reached at [sm@world.std.com](mailto:sm@world.std.com).*

For the archives of [comp.dcom.videoconf](http://comp.dcom.videoconf) and a list of reflectors for CU-SeeMe, enter the number to the right in the DocFinder box on the home page.

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of the packages allow end users to change settings such as brightness, saturation and hue. Videoconferencing mavens will appreciate how CU-SeeMe allows users to change more sophisticated video settings, such as gamma correction factor and smeared "I" frame rate.

The "I" frame rate specifies how often a full frame is distributed, or smeared, over a number of frames. To smooth video reception and reduce data loss, the video coder/decoder does not typically present each full frame as it is received. Instead, it examines the differences between frames and then adds new information to the previous frame.

To cope with the inevitable data loss associated with video transmissions, the video codec periodically smears a full frame over a number of frames. More reliable — meaning less noisy — transmission media typically benefit from more frequent full-frame insertions.

The bottom line is that all of these pack-

## A step up: Intel ProShare

Low-end, inexpensive videoconferencing applications are a great way to address the needs of a small cadre of users, but they're not the right answer if you need to make videoconferencing available throughout your enterprise.

For that, you're going to need a higher end system that offers some top-down control. That is, you need to be able to monitor and, if necessary, manage the traffic generated by these potential bandwidth hogs, particularly on a busy network.

As a prelude to future videoconferencing reviews, we took a quick look at Intel Corp.'s ProShare. From the client side, it's a slick-looking application. And from the network manager's perch, it offers the tools to control bandwidth, log activity and disconnect calls, though it requires a separate management application — LANDesk Personal Conferencing Manager — that must run on a dedicated PC.

If your site is already using LANDesk Manager, you can use the LANDesk Manager Control Panel to launch Conferencing Manager. Otherwise, you can run it stand-alone. If you're only planning to conduct videoconferencing sessions over ISDN or analog modems, you don't need Conferencing Manager.

The ProShare client interface — a conference room metaphor replete with window and mountain view — is intuitive. The product supports videoconferencing via TCP/IP, Novell IPX and NetBIOS LANs, as well as analog and ISDN modems. Users can conduct videoconferences and data conferences — application sharing, notebook, photo exchange and file transfer — simultaneously or independently. It supports the ITU's H.320 videoconferencing and T.120 data conferencing standards.

We found the video images transmitted and received by ProShare clients were cleaner and noticeably more fluid than those offered by the low-end packages we reviewed — even when we ran the lower end software packages with the ProShare cameras and video capture board.

ProShare also facilitates multipoint video conferences, but only through ISDN connections. And you'll still need a multipoint control unit (MCU) — either your own or a service provider's. If you want to pro-

vide multipoint conferencing over your LAN, you're pretty much out of luck; you can conduct data conferences over TCP/IP, IPX and NET-BIOS, but not videoconferences.

It can also be cumbersome to get your users up and running. You need to install a video capture board and an ISDN board, even if you don't plan to use ISDN; without it, the software installation will abort.

But, here's the real rub. You also must install Intel's LANDesk Personal Conferencing Manager on a dedicated PC client on the network. Then, you must manually edit a .INI file on every ProShare client so they can communicate with the LANDesk manager and, hence, each other.

When all's said and done, it works. Users can conference and managers can exert control over the resulting network traffic. Some overtaxed managers may resent putting in additional time installing and managing a separate, proprietary management application, but it's not a huge price to pay to keep order on the network.

— Stuart Melnitsky







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Candidates who register for the Career Mail service receive a weekly online job listing that maps to their qualifications. Another service, called Resume-Mail, automatically searches candidates' resumes posted to E-Span's Resume Database ([www.espan.com](http://www.espan.com)). The resumes are then matched to criteria listed by registered employers, and a list of qualified candidates is forwarded weekly to employers.

E-Span: (800) 682-2901.

■ **National Education Training Group's (NETG)** vendor-specific training courses are now available through Oracle Corp.'s Oracle Learning Architecture (OLA) Internet service.

When you subscribe to OLA ([ola.us.oracle.com](http://ola.us.oracle.com)), you can take NETG's courses online or download them to your desktop. Available now are courses to help you learn Microsoft Corp.'s Windows NT 3.5X and 4.0, NT 3.5X Server, 3.5X Workstation and 95; Novell, Inc.'s NetWare 4.0; and Lotus Development Corp.'s Lotus Notes R4.

The cost per course is between \$50 and \$500.

NETG: (800) 265-1900.

■ **ExecuTrain Corp.** is shipping its first Multimedia 2.0 CD-ROM training course, called Lotus Notes 4.0 End-User Basics.

A new audio/text toggle feature enables network administrators or users to cancel the download of audio files as they move the training program from a server to the desktop, which means trainees rely on text blocks to describe what they see on-screen.

In addition to preserving bandwidth, the option makes for sound-free desktop training in open office environments. The new CD-ROM also has improved student data capture, formatting and reporting tools.

A single-user version costs \$99; network licenses are priced between \$595 and \$8,000.

ExecuTrain: (800) 843-6984.

## Be prepared to lose your job

By Frank Schoff

There it is — the handwriting on the wall, plain as day. If only you had seen it in time to do something, you wouldn't have that gut-wrenching anxiousness about being jobless.

You probably thought it would never happen to you. But the stark reality is that it happens more often than you imagine. All it takes is a change in corporate strategy, a downturn in business or the winds of change sweeping through office politics, and you're out.

If you haven't planned for this dire turn of events, you'll have a tougher financial and emotional time rebounding from it. However, if you recognize the telltale signs that your job is in jeopardy, you can quickly activate contingency plans — perhaps just as your former employer did when

sales went south and the project you were working on got axed.

Part of your contingency plan should deal with the sudden money woes associated with losing your job.

You also need to deal with losing a major part of your identity and experiencing a dip in self-esteem.

### Get moving

Those are a few of the all-too-real reactions to job loss. But the overriding reaction should instead be to get on with it, get over it and, simply stated, get a job.

In talking to people who have gone through unanticipated joblessness, I have found that most agree they gained a great deal from it. Why? They devoted their full mental energies to managing their careers, perhaps for the

first time in their lives.

More importantly, they came out of the experience strongly committed to an ongoing, active career management process, deciding to never again be caught unprepared. So instead of feeling sorry for yourself, treat your job loss as an opportunity to find something better.

### Writing on the wall

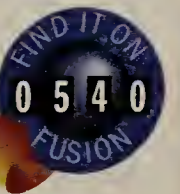
Related stories on this page will help you pick up on the signals of impending joblessness and decide what to do when it happens.

Schoff is president of Management Recruiters in Cedar Mountain, N.C., and specializes in the placement of networking professionals. He can be reached via phone at (704) 884-4118 or by fax at (704) 884-3512.

If you suspect your job is in jeopardy, jump onto Network World Fusion for more resources.

- A *USA Today* article with suggestions from financial planners on how to set aside some cash now — while you still have it.
- Strategies for dealing with the emotional stress of being laid off.
- A run-down of the four most common reactions to being fired.
- Answers to commonly asked questions about whether you need a lawyer when you've lost your job.

Enter the number to the right in the DocFinder box on the home page.



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## Look for the signals

If you watch for signals of impending job loss, you can start to prepare yourself for the worst.

On a personal front, the sun may be setting on your career with a company if:

■ You've suddenly been moved into a so-called special project.

■ You've been removed from your place in line to receive strategic business information or are tossed out of the group of key decision makers.

■ You get a new boss whose job description is very similar to your own and you report to that person.

■ Your subordinates are promoted to positions at or above your level without your recommendation.

You should also listen for executives uttering phrases that could be indicative of pending layoffs, such as:

■ "We need to focus on our core business."

■ "We are reengineering to gain operational efficiencies."

■ "Analysis shows that non-revenue-producing costs as a percent of sales have increased."

■ "We think outsourcing is the way to go."

If you detect any of these signals, don't ignore them. Instead, try taking one or more of these steps:

■ Open a dialogue with your boss, or others, to determine exactly why these signals exist. This may not be easy to do, and it may be uncomfortable. But so is losing your job.

■ Freshen up your resume, and alert your network of contacts that you may need help.

■ Straighten out your finances. Avoid taking on any new debt, and pay off as much existing debt as possible. Start to build or expand your financial reserves.

■ Keep a journal. Record your thoughts and actions, as well as the actions of others who may impact your job.

— Frank Schoff

## When the ax falls

The signals were clear, and it's finally happened. You're out of work. What now?

■ Deal with the emotions. Most people who lose their jobs have two strong reactions: a remarkable sense of relief and anger. They're relieved because the mystery, uncertainty and anxiety are over. They're angry because they feel wronged, and may even want to strike back through a lawsuit or some other grim act of reprisal.

■ Get rid of the anger. Negative thoughts and actions will only consume energy better devoted to the higher priorities of establishing financial stability and getting a new job. Discipline yourself to focus on the positive events that the future holds, and ask everyone who supports you to do the same.

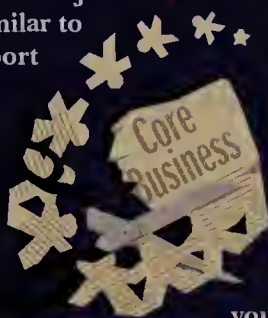
■ Establish financial stability. Take a complete financial inventory immediately.

Review the status of your savings,

other sources of income and your eligibility for unemployment compensation. Determine your basic and optional expenditures, and be prepared to delay some of the important but optional ones, such as a vacation or going back to school. This may be painful, but you have to take control. Calculate how long your reserves can last. If they won't last six months, review your optional expenditures again.

■ Try to get out of your house when job searching. If you've been offered outplacement, use it. Otherwise, see if you can borrow an office somewhere. If all else fails, camp out at your local library. Don't sit at home where you're surrounded by things that need to be done. That will only distract you and taunt you to eat up your financial reserves.

— Frank Schoff





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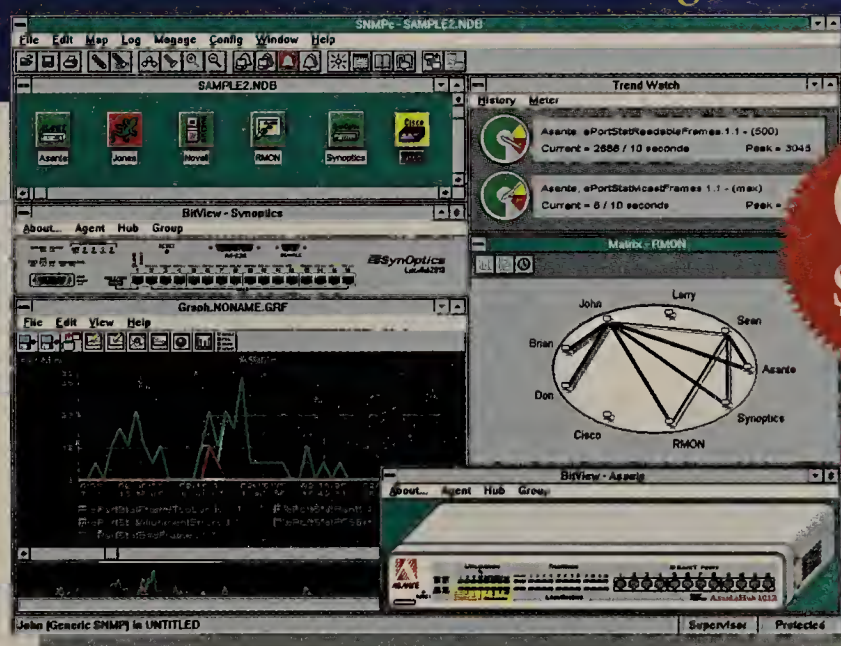
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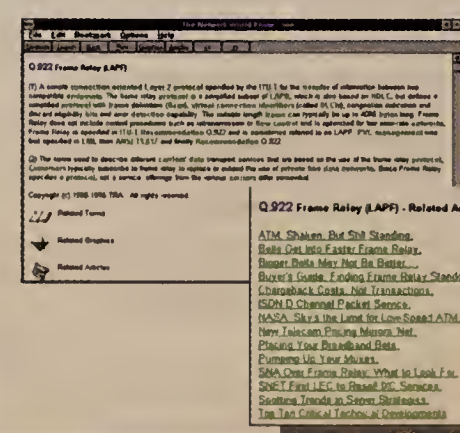
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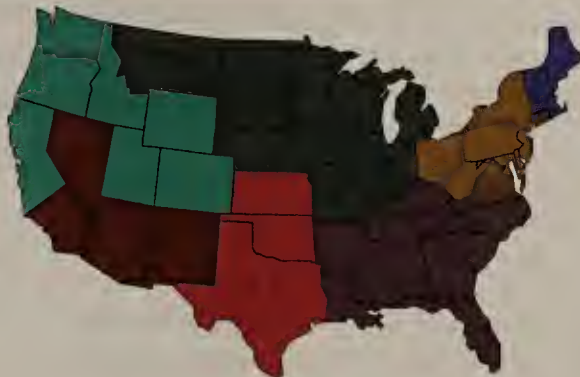
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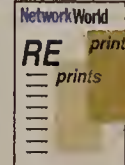
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## Modems

Continued from page 1

not disclose when it will offer services, did say it will take its time.

Although UUNET Technologies is testing 56K bit/sec technology, it will wait for things to settle down. "We plan to support 56K modem access, but two things have to happen before we do that," said Alan Taffel, vice president of marketing and business development at UUNET Technologies, a subsidiary of WorldCom, Inc. "The technology [supporting the full 56K bit/sec] cannot actually be deployed by any manufacturer or ISP until the FCC approves it. We are very hesitant to deploy something that is not an agreed upon as a standard."

The technology tops

out at 52K or 53K bit/sec under current Federal Communications Commission power restrictions.

BBN Planet has taken the same position and will not offer a service until a standard is complete, according to a com-

pany spokesman.

Taffel points to a "historical" example of why rushing is not a good idea. He still remembers V-Fast, which was U.S. Robotics' answer to V.34 prior to the standard. "It never caught on with users, and service providers had to eat the costs of their investments," Taffel said.

This time, U.S. Robotics is promising to upgrade to whatever standard is set, but they have not yet decided whether it will be free.

### Taking the plunge

Some ISPs, however, are more willing to take the plunge, but it will still take time. PSINet, Inc. is not waiting for the standards to become final, and is planning to roll out 56K bit/sec access services as soon as it has completed internal and customer testing, said Tony Kelly, director of corporate marketing at PSINet.

The company will upgrade all 350 point-of-presence sites with

new software for the Ascend Communications, Inc.'s Max hub that supports Lucent's K56flex technology, he said. But Ascend officials admit their tool is not yet ready, even for trials. Observers do not expect a PSINet service until the middle or later part of this year.

Smaller outfits may use the speed to stand out. MindSpring Enterprises, Inc., an ISP in Atlanta, has found the modems work well enough to press them into service as soon as they have tested the final version of the software. But the company will steer clear of advertising the

capability as full 56K bit/sec. Rather, they will use the name X2, which is what U.S. Robotics calls its faster modems.

Some modem vendors themselves are trying to moderate expectations. MultiTech Systems, Inc. has issued a white paper on the technology called "Look Before You Leap."

Paul Kraska, a product marketing manager for MultiTech, said his talk to ISPs led him to think they will not be deciding whether to buy until midyear. "I think if I were in their place, I would do the same thing," Kraska said. ■

### 56K BIT/SEC MODEM MILESTONES

#### End of February

56K bit/sec modems to debut

#### March

Earliest expected ISP service offerings

#### Year-end

Interim U.S. Telecommunications Industry Association 56K modem standard expected

#### 1998

Services from major ISPs expected

#### End of 1998

ITU 56K bit/sec modem standard expected

## Applications

Continued from page 1

Digital Equipment Corp., Expertsoft Corp. and Iona Technologies, Inc. In addition, the Message-Oriented Middleware Association this week is expected to throw its weight behind the effort.

Morgan, chief architect for strategic billing at Bell Atlantic Co. in Philadelphia. "A messaging approach to interobject communications bolsters the link between objects."

"This gives you 'plug-and-play' messaging transports and the hope of achieving interoperability among ORB vendors that

mance than is possible today.

The next week or so may be critical to achieving wide agreement on a useful specification, observers said.

"We need to look very closely at what it is they cannot agree on," said John Rymer, a vice president at Giga Information Group in Cambridge, Mass. "What will they end up leaving on the cutting room floor? The specification may [end up being] something people are not entirely happy with."

But it will probably be better than what users have now. Today, some companies are building their own object and messaging systems, or jury-rigging connections between existing products on their own offerings.

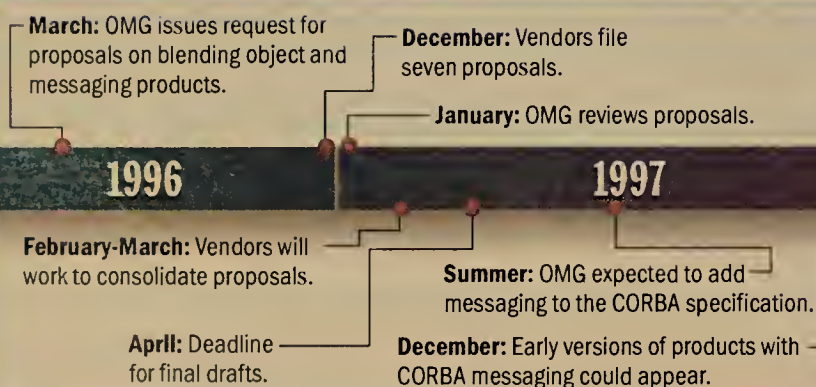
"It costs us to write code and to maintain it," Bell Atlantic's Morgan said. "And we may have future problems integrating it with new technologies."

Vendors say they expect fast OMG ratification of a standard, and products supporting it within six months after that. "The likelihood of this being commercialized by these vendors is extremely high," said Peter Tait, vice president of product marketing at PeerLogic.

Last month, at a meeting in Tampa, Fla., the OMG reviewed seven proposals from teams of vendors and users to blend messaging with objects.

The vendors now are E-mailing and teleconferencing with each another to consolidate the proposals. ■

### Time frame for message-based objects



If all goes as planned, the Object Management Group (OMG) should have a standard proposal in its hands by April that will extend its Common ORB Architecture (CORBA). Standard-based products should be out by year-end.

### Positive reaction

The combination of objects and middleware has customers excited.

"If you're communicating financial information over the network, you want absolute guarantees that a transaction was completed and acknowledged at the receiving end," said John

are using different message-oriented middleware transports," said Patrick Ravenel, a principal software engineer at San Diego-based Expertsoft.

The OMG plans to use the proposals to extend its CORBA, which specifies how ORBs can work together over a network. Once incorporated into products, the standard will let CORBA software objects interact via commercial message-oriented communications software. Object applications, and legacy applications with an object interface or wrapper, will run over WANs with greater reliability, resiliency and perfor-

### HOW IMPORTANT IS IT FOR YOUR ISP TO SUPPORT 56K TECHNOLOGY?

*"Well, I wouldn't buy a 56K modem unless I know they have it at the other end. But if they support it, I'll get it — depending on what it costs."*

John Cormack, electronics engineer, Defense Information Systems Agency

*"When is the standard going to be available? When the ITU adopts something — I'll guess that takes a year, probably two, because they are so methodical."*

*Unless you have to have the latest toy, my advice would be to stick it out and wait for the standard."*

Brad Skillman, systems engineer, Sparta, Inc.

*"The big thing for me is interoperability. If it works, I'll go with it over ISDN or frame relay. The standards issue, if it's ugly, is just going to hurt the industry."*

Richard Bullington, chief technical officer, The ObjectLink Corp.

## Middleware with a Java twist

Open Horizon, Inc. this week begins beta-testing a messaging middleware product for building Java applications with enterprise-grade features such as guaranteed message delivery, security and transaction support.

Those features are badly needed if firms are to trust 'Net/Web nets with critical business processes and information.

The new software, called Ambrosia, lets applications interact over the Internet/Web by exchanging messages through a system of queues (which are like mailboxes). Messaging is seen as a simpler mechanism than other programming techniques because the applications themselves do not have to be changed.

Applications send, or publish, these messages following an event such as a request for credit data or a change in inventory. Ambrosia's event manager routes each message only to those applications that have registered or subscribed to them. There is a simple Java API for connecting Java clients in Web browsers and a set of net services such as security and guaranteed delivery.

The messaging server includes several built-in services, such as guaranteed message delivery and advanced security, that are automatically applied to the message traffic. Finally, Ambrosia has an administrative console to manage its applications.

Ambrosia is now in beta test, with general availability targeted for April. A special introductory price is \$5,995, which includes a full year of technical support. For more information, contact Open Horizon at (415) 869-2200.

—John Cox



## Novell

Continued from page 1

Internet standards-based follow-on to NetWare — that will enable companies to standardize on a single transport protocol from the desktop and across the WAN.

The native TCP/IP rollout will be the latest in a string of moves by Novell to give IPX network users access to TCP/IP resources. Administrators can already integrate TCP/IP into their networks using either IPX/IP gateways or NetWareIP, which lets IPX traffic run over TCP/IP. Both of these stand-alone products were rolled into IntranetWare last fall.

The key to moving to Novell's native TCP/IP implementation will be making customers' TCP/IP environments as easy to manage as IPX ones, Novell officials said. "Users are waiting for native [TCP/IP] support, but it's not as easy to [manage] as IPX," said Samm DiStasio, product marketing manager for IntranetWare. "We want to make our TCP/IP implementation as plug and play as IPX."

To that end, Novell will tie Novell Directory Services (NDS) to TCP/IP-based administration tools such as Dynamic Host Configuration Protocol (DHCP) and Domain Naming System (DNS) servers. This integration will simplify the task of managing dynamic TCP/IP addresses and complex host names.

IntranetWare now ships with DHCP and DNS servers. DHCP facilitates management of TCP/IP nodes by handing out and tracking dynamic IP addresses to desktop machines. DNS handles name resolution between host sites. Both server types employ Btrieve Technologies, Inc. databases for tracking IP addresses and long host names.

Currently, synchronization between DHCP and DNS servers and the Novell directory is done manually. However, the IntranetWare upgrade expected this summer will let DHCP and DNS servers employ NDS as a unified repository. NDS will support the IP-based Service Location Protocol, which will allow DHCP and DNS servers to publish IP address and host name changes to NDS, which, in turn, will replicate changes across the network.

"IP administration is tough. Tying it to the directory will make management much more efficient than anything out there now," said Rick Villars, an analyst with International Data Corp. in Framingham, Mass.

Hallmark Cards, Inc., which has a network comprising 60 NetWare 4.X servers, is rolling out a dozen Novell DHCP servers at sites across the country to give its 6,000 workstation access to IP services. Dan Blevins, a

technical analyst with the Kansas City, Mo., greeting card maker, welcomes any future IP integration with NDS.

"Setting up DHCP servers is a breeze, but there is no way to tie those to NDS, so you have to handle access to IPX and IP resources separately," Blevins said. While the company has made a strategic decision to stick with IPX as its LAN transport protocol and IP for Internet ties, this type of integration could force Hallmark to rethink that decision.

In addition to this new TCP/IP directory integration, Novell is also opening up its security service to support the emerging Internet Protocol Security standard for encrypting IP packets and Secure Sockets Layer for running applications more securely over TCP/IP nets.

DiStasio said Novell will ship native TCP/IP support as an option. Upon installing IntranetWare, customers will be able to choose among straight IPX, IPX encapsulated in TCP/IP or native TCP/IP. ■

## Novell to inaugurate Jefferson

**A**t Demo 97 this week in Palm Springs, Calif., Novell, Inc. is expected to take the wraps off its Jefferson Project, a key piece of the groupware maker's push to Web-enable the GroupWise product line.

Jefferson will provide browser access to document repositories within GroupWise through an HTML Web server that is "bolted onto" those repositories, analysts said. Managers can control which documents are published to the World-Wide Web, and who receives what level of authority to change them.

Individuals will be able to publish from these GroupWise "libraries" to the Web with little more effort than is now required to save documents. The software will save administrators time by automatically indexing and cataloging documents, sources said.

Meanwhile, Cambridge, Mass.-based Lotus Development Corp. is preparing to unveil Domino Document Manager, an add-on to the Domino server sources said would plug holes in Lotus' document management capabilities and eventually blunt the competitive advantage Novell hopes to gain with Jefferson.

While Lotus would not comment last week, the add-on reportedly includes check-in/check-out controls and allows the Domino messaging and Web server to manage shared documents that may be altered by multiple users. While Novell declined to divulge details of Jefferson last week, a May release is expected.

"What they're trying to do is make the GroupWise document repository a more functional piece of software," said David Strom, who runs a consultancy in Port Washington, N.Y.

Paul Cook, a systems specialist at Utah State University, said Jefferson will ease life for managers by letting nontechnical users post to Web sites. "It's a two-step process vs. an [existing] eight-to-10-step process," he said.

One analyst, however, believes the appeal may be limited. "The conversion to HTML is interesting, but I don't know if it's going to be what everybody wants all the time," said David Yokelson of META Group, Inc. in Stamford, Conn. "What remains to be seen will be the fidelity of the conversion to HTML."

—Paul McNamara

## Novell gives NT a hug

**N**ovell, Inc. this week will complete the second phase of its Novell Directory Server (NDS) and Windows NT Server integration strategy by delivering a tool that synchronizes user data between the two systems.

This utility, code-named Tabasco, was originally expected to ship by the end of last year. However, the product was delayed so Novell could add stronger security features and tools for migrating NT user data to NDS in groups rather

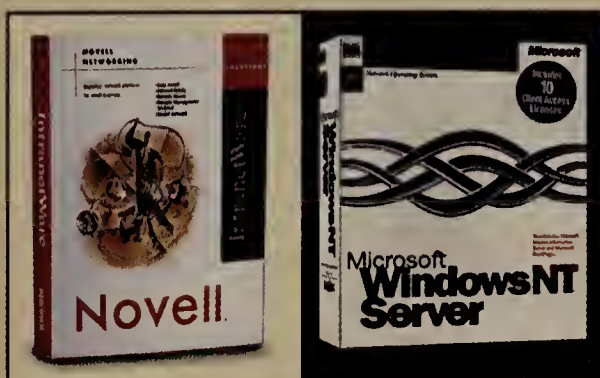
than individually. Pricing and packaging information was not available.

The first phase of Novell's NT integration plan involved Windows NT client software that gives Microsoft Corp. desktop users full access to all IntranetWare services. The company also

rolled out Novell Workstation Manager, which gives administrators complete control over NT workstations via NDS.

The final phase will come to fruition this summer when Novell delivers NDS running natively on NT Server.

—Christine Burns



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# Backspin

## Ignore the technology details and make your life simpler

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You: Well, for starters, what's the composition of the alloy used for the crankshaft, and what is the coefficient of expansion of the piston rings relative to the cylinder?

HJ: Huh?

You: And what's the nominal operating temperature of the cylinder head and the original Munsel value of the paint work?

HJ: Are you on something, buddy?

You: Oh, and what is the RMS power and mean frequency of the radio signal generated by the ignition system?

H.J.: Hey, Luigi, see dis bum off da premises. We ain't got time ta waste wit' joiks....

Obviously, this is not a typical conversation to have when buying a car (particularly when there are large, powerful gentlemen named Luigi around).

But the fact is you don't ask for this sort of detail when you buy a car. Or, for that matter, when you buy a washing machine, a VCR or any of a thousand other items.

*You see, most of the time, the detailed, down and dirty, nitty-gritty technology is a waste of time.*

But go and buy any item of computer technology and it is expected that you'll ask for incredible detail and expect to receive answers.

(Well, I guess that is unless you go to CompUSA. Just yesterday, I asked a CompUSA salesperson if they had a VGA-to-NTSC converter, and I was told they could only get me one on special order. I then walked over to a shelf and found one right in front of me.

But I digress.)

Where was I? Oh yes... so we embark on our technology acquisition exercise (spending spree) with questions such as: Does this implement RFC 666? Is the status

flag on that toggled according to the blue book? How is the data stored in the database? What kind of compression is used?

The level of detail of our questions is amazing. We want to know everything, and we expect enlightenment.

Even more astoundingly, we think these answers matter.

You see, most of the time, the detailed, down and dirty, nitty-gritty technology is a waste of time.

So, what is the right approach? Let's go back to the car scenario: When you are considering buying a set of wheels, you simply treat the car's subsystems as black boxes.

You want to know about inputs and outputs, not whether the knee bone is connected to the thigh bone.

You ask things such as, "How much gas does this baby hold [input], and how many miles to the gallon will I get [output], and how fast will she go [output]?"

Well, why don't we treat computer technology products the same way? Why don't we treat them like black boxes?

Sure, we do to some degree when we evaluate, for example, computer system performance; you are essentially asking what is output for certain inputs. But I would guess most of you know how ATM works, what CSMA/CD is and know other pieces of obscurata. You are, or feel you need to be, intimate with the implementation.

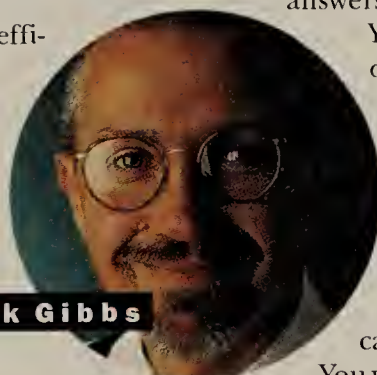
In the past, this was justifiable: Network technologies were very new and far from proven. And network products were, by today's standards, very expensive. You had to be careful, and you had to perform due diligence when you were considering buying anything.

Today, it is different. Network products are, on the whole, stable and robust. And they are inexpensive. If the inputs and outputs specified by the vendor are inadequate or wrong, you kick them out.

I recommend that you start to consider your network subsystems as black boxes. Ignore the unnecessary technology detail and simplify your life.

*Do you sport a pocket protector? Confess via E-mail at mgibbs@gibbs.com or phone at (800) 622-1108, Ext. 504. Oh, I finally got the "I digress" limited edition T-shirts. If I promised you one, send me back my message so I can make you happy.*

Mark Gibbs



# 'NET BUZZ

The latest on the Internet/intranet industry.

By Chris Nerney

**ART OF THE DEAL, ATG-STYLE** Boston-based Internet application and development tool vendor Art Technology Group (ATG) has announced a \$3 million financing agreement with Internet uber-investor **SOFTBANK Ventures, Inc.**

It is the first outside financing accepted by ATG since its founding in 1991 by MIT graduates **Jeet Singh** and **Joseph Chung**. The 100-employee company until now has relied exclusively on — get this — *revenue* to fuel growth. (Obviously, Singh and Chung haven't read up on how to do this start-up thing.)

Singh said the financing move was prompted by a desire to promote a new group of Java-based Internet management applications for organizations with consumer-oriented Web sites. "We thought the timing now was right to spend some money on marketing," he said.

Looking down the road, Singh said an IPO "is a reasonably likely occurrence in the next 24 months, [though] it's not a given, and not a goal either."

**FIREFLY NETS SOME ANGELS** Firefly Network, Inc., a collaborative filtering technology company, has purchased an agent application developer based in San Francisco.

The purchase of **NetAngels** is part of Cambridge, Mass.-based Firefly's strategy to extend its open server platform, allowing businesses to create personalized communities online and to deliver personalized content.

Firefly is best known for its Web site, which uses collaborative filtering to direct members to music and movies they like best. Members submit information about personal preferences, which Firefly uses to point them toward stuff they'd like. As additional data is submitted, collaborative filtering allows Firefly to more precisely determine members' tastes.

**SEARCH ENGINE CALLED FOR CLIPPING** Excite, Inc., an Internet search engine company based in Mountain View, Calif., has launched a free news-clipping service for the Web.

The service, called NewsTracker, allows users to search a database of more than 300 magazines and newspapers, track up to 20 news topics — yes, including the civil trial of **O.J. Guilty** — or browse several news categories. NewsTracker also utilizes intelligent agent software that allows users to customize information.

**WHY NETWORK MANAGERS ANNOY AOL** Mark Walsh heads a unit of America Online that you don't hear many complaints about. Walsh works with businesses

to set up "private AOLs" — you could call them "AOL-tranets" — that are inaccessible to the unwashed newbies, not that any of them can actually make a connection these days.

But Walsh has some complaints of his own. Serving on a panel at last week's **Information Industry Association** Venture Forum in New York, he was asked what posed the biggest threat to his unit's business. His answer: Fear, uncertainty, and doubt among MIS managers about how the Internet will affect their corporate networks and their jobs.

"When we go into a company, the last people we want to talk to are the MIS people," Walsh said.

Ouch. Maybe he could just mail them some disks instead.



*So you think a few cheap gifts and fast moves will earn you the privilege of being our valentine? Guess again. If you really want to win us over, have FTD deliver us your most heartfelt Internet and intranet news. Contact Chris Nerney at (508) 820-7451 or cnerney@nww.com.*



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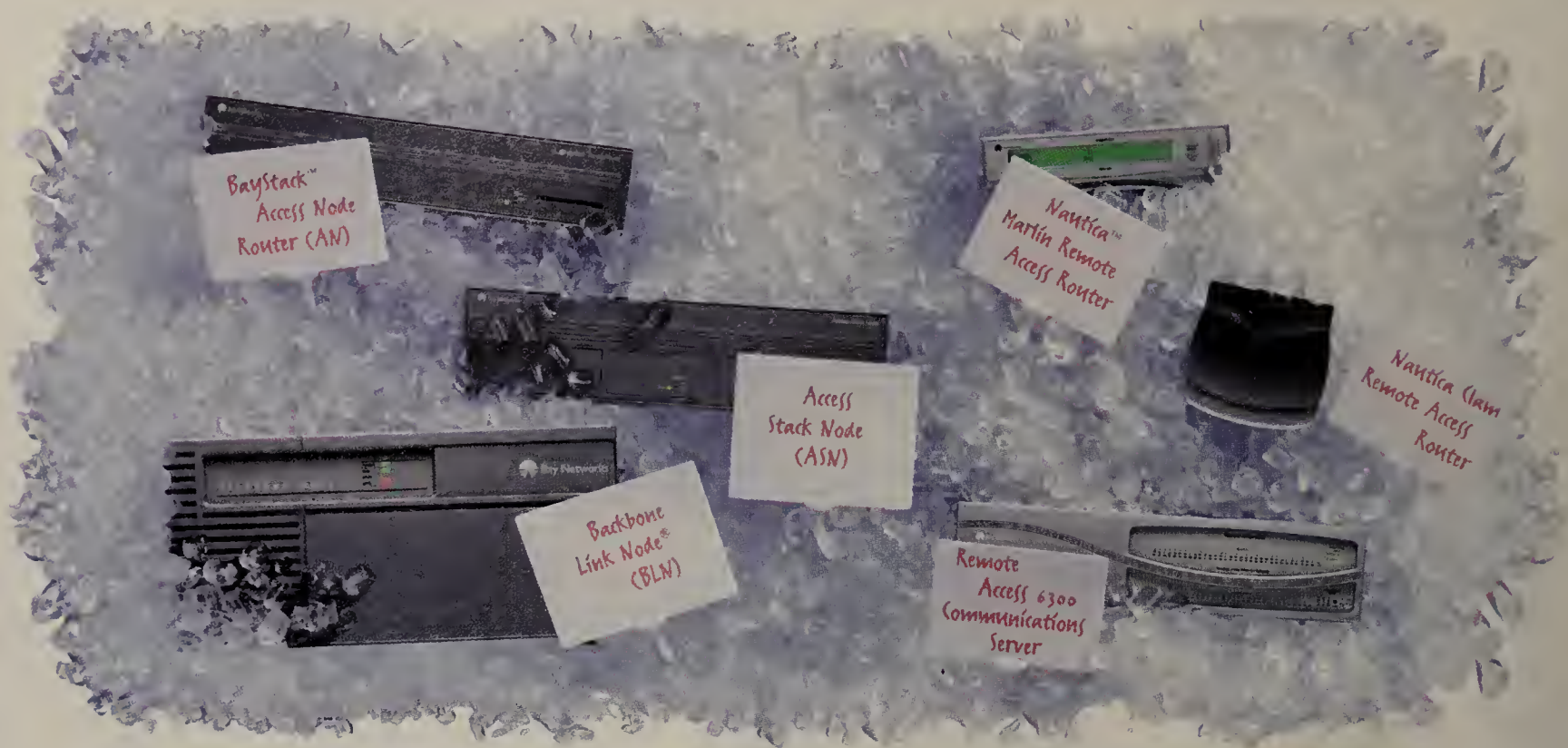
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